

november 1959

# nlgi spokesman

journal of the national lubricating grease institute

## Economic Planning for 1960

By R. ROBEY

## Newly Elected Officers and Directors for 1959-60

## What's Wrong with Motor Oil Sales and What to Do About It

By R. CUBICCIOTTI

## Non-Soap Greases III. A Systemization of the States of Solids Dispersed in Organic Media

By J. J. CHESSICK

## NLGI 1958 Production Survey





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# nlgi spokesman

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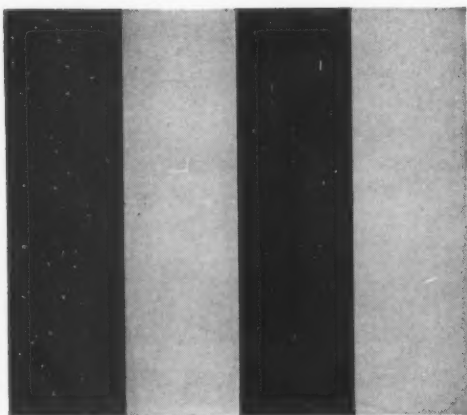
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## THE COVER

NLGI's "Award for Achievement" has been awarded only eight times and here, W. H. Saunders is the eighth recipient, while Mrs. Saunders watches proudly. Giving the tray for the Institute is W. M. Murray, a member of the Board of Directors and a past president of NLGI. Saunders was honored for his 25 years of service on the NLGI Board of Directors, during the Annual Meeting in his native city of New Orleans. Story on page 310.

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## NLGI PRESIDENT'S PAGE

By H. A. MAYOR, JR., President



### To Guide Us In Our 28th Year of NLGI Activity

"A trade association is an organization for mutual benefits which substitutes knowledge for ignorance, rumor, guess and suspicion. It tends to substitute research and

reasoning for gambling and piracy, without closing the door to adventure or lessening the value of prophetic wisdom."

*Justice Louis D. Brandeis*

In a different vein but just as meaningful:

A stage driver passed o'er a trail one day,  
Past meades and woodland he took his way,  
His long whip snapped with unerring aim,  
Whether standing or moving, 'twas just the same,  
A horsefly here, a butterfly there  
Fell to his aim, as they winged the air.  
A hornet's nest hung on a limb nearby,

But the driver passed that carefully by,  
"How come?" the passengers cried—much surprised.  
"Why," he answered, "them hornets is organized."  
Horsefly, butterfly, grasshopper, too,  
Their fate is a lesson and warning to you.  
You will flutter and fail like the hoppers and flies.  
Unless, like the hornets, you're organized.

*—Author Unknown.*

Toward these objectives, your 1960 officers and committees pledge themselves!





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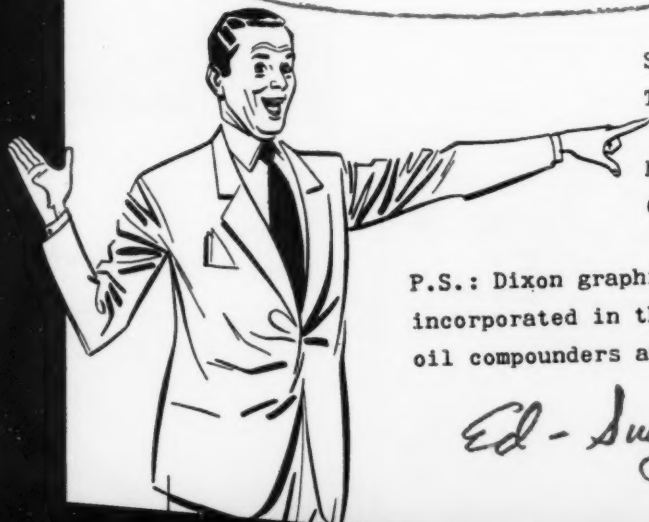
THE JOSEPH DIXON CRUCIBLE COMPANY

*E. M. Starn*  
Manager

Graphite & Lubricants Division

P.S.: Dixon graphites are currently being  
incorporated in the products of many grease and  
oil compounders and blenders.

*Ed - suggest we send for this!* *OK*  
*J.W.J.*



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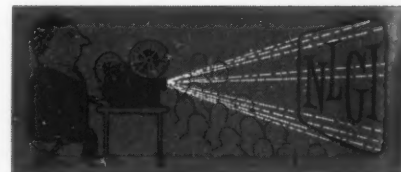
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n l g i



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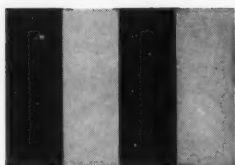
For complete data on Darina Grease, write Shell Oil Company, 50 West 50th Street, New York 20, New York, or 100 Bush Street, San Francisco 6, California. In Canada: Shell Oil Company of Canada, Limited, 505 University Avenue, Toronto 2, Ontario.

## **SHELL DARINA GREASE**

*the multi-purpose, high-temperature grease*







# News About NLGI

## Shaffer Report for NLGI Board Meeting

*The following is a report presented to the NLGI Board of Directors at the New York City meeting, by T. F. Shaffer of Shell, the Institute's Board representative to the API-NLGI Joint Container Committee. Following the report it was suggested that because of an interest in bulk handling of lubricating grease in containers of rubber and steel, Mr. Shaffer was asked to mention the Institute's interest at the October 12 meeting in Port Arthur, Texas.*

The Petroleum Packaging Committee had a meeting June 8-9 at Cleveland, Ohio. The following summarizes highlights of the meeting.

### 1. Progress on the Testing and Use of Light Gauge Steel in Packages.

a. 5-Gal. Pails—The report at the February meeting mentioned that two beads properly located around the body of a 5-gallon pail increased its strength considerably, permitting the use of lighter gauge steel. After further discussions with S.S.C.I. and further strength tests, a standard 26 gauge 5-gallon lug cover pail is being proposed, and will be subjected to further shipping tests. The proposed 26 gauge pail is unchanged from present dimensions, but has a bead  $3\frac{1}{4}$ " down from the top, and a second bead  $3\frac{1}{4}$ " up from the bottom. Socony test shipments so far on these 26 gauge pails are as satisfactory as on present standard 24 gauge pails.

b. 55-Gal. Drums—Similar tests

were made on 20/18 gauge 55-gallon drums as to the relative strengthening effect (1) of beads and corrugations in the side above and below the standard rolling hoops, and (2) of changing the location and number of rolling hoops. The conclusion is that the best protection against (a) collapsing due to vacuum, (b) crushing by fork truck load grabs and (c) crushing of the upper panels of the drum from narrow drum racks, is attained by adding (1) a third rolling hoop half way between the standard hoops, and (2) seven beads in the panels above and below the standard hoops.

c. 400 Lb. Removable Head Drums—Shipping tests are being made on 20/18 gauge 400 lb. drums by Texas and Shell. Preliminary information is that the drums are satisfactory for shipping greases.

d. 120 Lb. Removable Head Drums—Socony is making further test shipments on 24 gauge 120 lb. drums (the present standard is 20 gauge). Data on the shipments are being reported to the National Board of Motor Carriers.

### 2. Shipping Cases

a. Vibration and revolving-drum tests show that the diagonal pack 28/1 quart case is equal or superior to the 24/1 quart case. At least one major oil company is studying the possibilities of converting present 24/1 equipment to use the 28/1 diagonal pack case.

b. Test shipments are continuing on gap-flap cases. They give some trouble in handling (on roller conveyors, etc.). Conclusions on the

practicality of their use will be forthcoming.

c. Two committees of the Packaging Institute, the Petroleum Packaging Committee and the Corrugated Box Committee, have agreed on a standard method for measuring the inside of shipping cases. The standard method will be published.

### 3. Standards

a. P.P.C. approved changing the maximum overall diameter of the 5-gallon tight head pail MH2. 9-1959 from  $11\frac{1}{2}$ " to  $11\frac{31}{64}$ ". This change of  $\frac{3}{64}$ " reduces the ocean cube of the pail from 1/1 to 1/0 ( $1\frac{1}{12}$  cu. ft. to 1 cu. ft.).

b. No standards are being recommended at this time for plastic squeeze tubes (grease), pending stabilization of the industry.

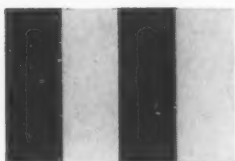
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**REPRINTS — From the NLGI SPOKESMAN** are available at low cost. Page forms are left standing for three months, company imprint or advertising arranged.





# Future Meetings

## NOVEMBER, 1959

9-11 API, 39th Annual Meeting, Conrad Hilton, Palmer House and Congress Hotels, Chicago.

10-12 API, Marketing Division, Congress Hotel, Chicago.

## DECEMBER, 1959

11-15 Society of Automotive Engineers, Meeting, Sheraton-Cadillac and Statler Hotels, Detroit.

## JANUARY, 1960

31-Feb. 5 ASTM, Committee D-2 Meeting, Statler Hotel, Detroit.

## FEBRUARY, 1960

25 API Division of Marketing, Lubrication Committee Meeting, Sheraton-Park Plaza Hotel, St. Louis.

24 NLGI Board of Directors Meeting, Park Plaza Hotel, St. Louis.

## MARCH, 1960

15-17 SAE National Automotive Meeting, Sheraton-Cadillac Hotel, Detroit.

## APRIL, 1960

19-20 ASLE, Annual Meeting and Exhibit, Netherland-Hilton Hotel, Cincinnati.

20-22 API Division of Production, Rocky Mountain District Meeting, Gladstone, Henning, & Townsend Hotels, Casper

20-21 National Petroleum Association, Hotel Traymore, Atlantic City

## MAY, 1960

18-20 API Division of Marketing, Midyear Meeting, Statler-Hilton Hotel, Cleveland

## JUNE, 1960

5-10 Society of Automotive Engineers, summer meeting, Edgewater Beach Hotel, Chicago

## OCTOBER, 1960

30-Nov. 1 NLGI Annual Meeting, Edgewater Beach Hotel, Chicago.



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# Economic Planning for 1960

By: Dr. R. Robey

National Association of Manufacturers

Presented as the Keynote Address at the  
27th Annual Meeting of NLGI, New Orleans

It is a great honor to be permitted to talk with you and I deeply appreciate it. As I have told your Mr. Miller, I fundamentally know nothing of the operation of your industry, and I am not going to try to pose as an expert. The best that I can do is paint the broad future and hope that it will be of some value in your own planning.

Specifically my comments will fall into three divisions. First, I shall take a few minutes to describe where we are today in the way of recovery. Secondly, I shall discuss some of the serious problems confronting us on the economic front. Finally, I shall draw these two sides together and give my opinion on the outlook.

First, then, let us look at the degree and breadth of the recovery we have enjoyed. Unfortunately this means using figures, but they are all simple.

The widest measure of economic activity we have is gross national product. That is the aggregate monetary value of all goods and services produced in the nation. It includes everything from shoeshines to the largest industrial installation. That the figure is enormous goes without saying. It is compiled by the government and just last Friday the figure for the third quarter was released. This was \$481 billions. In the second quarter the total had been \$484.5 billion. The decline, which was the first one since the recovery began, was due entirely to the steel strike—and I shall discuss that controversy a little later. The significance of this drop in GNP is that it rules out the possibility of our getting to that magic figure of half-a-trillion before the end of this year. It now means that we shall have to cross \$500 billion after the first of 1960. But at \$481 billion we are producing more, as you all know, than any other nation at any time in history.

Gross national product is stated in dollars and this means that it is affected by changes in prices. That is not true with the Federal Reserve Board index of production. That index, which uses D47-49 as equal to 100, is based upon physical output, and price changes do not influence it. The high of this index—it was an all-time high—was in June at 155. That meant that production in that month was 55 per cent above the average of 1947-49. In July the index eased off to 153, as a result of the steel strike. In August the index dropped to 149, and in September to 148. October almost certainly will show another minor decline, again as a result of the steel strike.

Another very important statistic is that for inventories. At the height of the recession business was liquidating its inventories at an annual rate in excess of \$9 billion. This year there was a complete turnabout, and until recently business was adding to its inventories at over \$10 billion a year. That is a swing of \$19 billion in this one item. During the past couple of months the rate of accumulation has declined, but it will pick up again because inventories still are low in relation to sales.

Still another figure we follow with care is business investment in plant and equipment. Since this includes machinery, I should think it would be of importance to your industry. The total on this is obtained by questionnaires sent to a representative sample of business firms asking for their plans. The high of such investment was a little over \$37 billion. During the recession it dropped to below \$30 billion. The estimate for the fourth quarter of this year is \$35.3 billion. That figure probably is too low. I say this because the record shows that these estimates usually understate the trend. In other words, if we are in a declining trend the estimate will be higher than the actual investment; if we are in a rising trend the estimate will be lower than the actual investment.

Consumer credit is on a sharp upgrade. The total now is about \$48 billion, and approximately one-third of this is on automobile paper—which probably is of concern to your industry. It is too early to make a forecast of the automobile industry for 1960, but the expectation is that it will be substantially better than in 1959.

And so it goes across the board. Retail trade is strong, except in those cities and localities hurt by the steel strike, business profits have been booming—they will be hurt a bit in the third quarter—; and so on and so forth. It is a picture, in other words, of a strong, broadly based recovery.

Let me add a footnote at this point. For many years we have had the habit of giving yearly wage increases. And the philosophy has been developed that so long as the increase does not exceed the rise in the output per manhour, everything is in good shape. Well, everything is in good shape only to the extent that under those circumstances prices do not have to be increased. But we have got to the position, in my opinion, where we no longer can afford to raise everyone's wages every year. We must get some prices down. That can

be done only by management using the increase in output per manhour to reduce prices. That is not going to be easy, but it is the only manner in which we can stop pricing ourselves out of more and more markets, both here and abroad.

A second great problem facing us is our national deficit in international payments. Currently our international deficit is running at something over \$4 billion a year. So far there is no evidence that foreigners are losing confidence in the value of the dollar. This is shown by their continuing to take their credits in increased balances held in this country. These balances now amount to well over \$15 billion. Last year, it is true, they pulled \$2.3 billion of gold out of our reserves, but the export of gold has declined sharply this year, and we still have some \$19.5 billion—about one-half that of the free world. But no nation can withstand such an unfavorable deficit indefinitely.

The deficit is not caused by imports. We still are selling more goods abroad than we are buying, although the volume of imports has been increasing sharply in the past year or so, and the number of items coming into our markets is growing by leaps and bounds. The deficit is caused by financial transactions. We are spending about \$3 billion a year abroad on military items and our foreign aid is running around \$2½ billion. In addition there is about \$2 billion of private foreign investment a year.

The two most common suggestions for solving this problem are increasing tariffs and increasing the price of gold, which means devaluing the dollar. Neither of these will work. Of course there may be some industries which should have an upward revision of the tariff, but it is unthinkable that the United States, the greatest creditor nation in the world, should attempt to protect itself against foreign competition by a tariff wall. Devaluing our currency will not work because foreign nations can play that game just as well as we can. It also would be a national disgrace.

No, the answer to this international problem has to be found in other directions. We need to get foreign nations to remove the tariffs, quotas, and other handicaps to the import of American goods. We need to overhaul our farm surplus disposal program, which will necessitate a new domestic farm program. We need to get foreign nations to remove restrictions on the convertibility of their currency into dollars, so our producers operating abroad can get their earnings back in this country. We need to overhaul our foreign military and aid programs. And we need to get our own prices down—down to the point where the foreign producers do not have their present advantage.

Another problem facing us is the position of the United States Treasury. This is a peculiar problem. The budget is balanced and according to the mid-year review will show a surplus this fiscal year ending next June 30 of \$95 million. This estimate was made before the steel strike really began to bite, and was based upon continued good corporate profits. I think the estimate

was conservative, and accordingly it is my opinion that we shall still have a surplus this fiscal year.

The Treasury problem which deserves worry is of a different nature. Some few months ago the Administration asked the Congress to do three things—raise the debt limit, authorize it to pay a higher rate of interest on E and H savings bonds, and remove the 4¼ per cent interest ceiling on government obligations of five or more years maturity. Under the rules of the Congress all legislation of this type must come out of the House Ways and Means Committee, and that is where the Administration request was made. I listened to the presentations and they were excellent. At the time it was assumed that the House would act favorably without any particular trouble, and that there would be a substantial squabble in the Senate, but that chamber also would agree.

Well the debt limit was raised without much debate, but then the Democratic leadership decided to make a political issue out of interest rates. Finally the Congress gave the authority to increase the interest rate on E and H savings bonds, and that rate has been raised to 3¾ per cent, but the Ways and Means Committee never was willing even to report out a bill removing the 4¼ per cent interest ceiling.

This ceiling was imposed in 1918 and covers only those obligations of five or more years maturity. For obligations of under five years maturity there is no ceiling. As a result of this lack of action the United States today has to do all of its borrowing on short term paper, and a short time ago offered obligations with a maturity of four-years-ten-months at 5 per cent interest. That issue was heavily over-subscribed, but that is a quite terrific rate for the United States government to have to pay.

It also should be noted that for some years there has been a statute on the books authorizing the Treasury to sell long term obligations at a discount. In his testimony before the Ways and Means Committee Secretary of the Treasury Anderson said that it is the opinion of the Treasury that it is not appropriate to circumvent the ceiling in this manner. With the advantage of hindsight I think that statement may have been an error. Canada recently offered obligations at a little over \$94 which gave a yield of well over 6 per cent. No one became disturbed about the financial condition of Canada because of this action. The United States could have offered bonds at a discount and it would not have caused any real lifting of eyebrows. But by the Secretary's blank statement, that door was closed. If the Treasury today offered obligations at a discount it is quite probable that some one would maintain that regardless of the law it is contrary to the intent of the Congress. If that contention was upheld, our Treasury would be in a real mess.

What is wrong with the Treasury doing all of its financing in the short-term market? Several things are wrong. It makes it impossible to lengthen the average maturity of the debt. It requires frequent trips to the



money market, which is upsetting. Finally, short term paper is bought for the most part by commercial banks and is paid for by bookkeeping entries. This means an increase in the money supply, and that tends to be inflationary.

It is taken for granted that next January the Administration will make another effort to get the Congress to eliminate the 4¼ per cent interest ceiling. Whether it will be any more successful than it was this year is anyone's guess. I should have mentioned that most of the United States bond issues outstanding today yield more than 4¼ per cent. It is for that reason that the Treasury cannot sell such obligations at present.

Intimately related to this Treasury problem is the money market itself. As you all know we have what is termed tight money clear across the board. Rates are high in relation to the past quarter century. Of course the great growth of the nation came when rates were much above those of today, but no one likes high rates of interest. The sharp run-up of rates was caused primarily by the \$12.5 billion deficit of the United States in the fiscal year ending last June 30. A second factor entering the picture is that the demand for long-term funds is clearly above the current supply of savings. This already is beginning to curtail building, as I mentioned earlier, and in time its effects will spread over more and more of the economic system. This problem must be solved by our getting a larger volume of savings, and that can be done only by tax rate reform.

Still another major problem facing us is the danger of inflation. Many persons are saying the talk about inflation is a phoney. I can assure you that it is not. The threat of more inflation is real, just as real as anything can be.

What appears to be fooling people is that our prices recently have been rather stable. But that stability has not been real. Wholesale prices have shown no discernible over-all trend for the past year. If one looks at the broad divisions of the index, however, he finds that farm prices, and the prices of processed foods, have both been declining, and this decline has been sufficient to offset the rising trend in other prices.

In the consumer price index, which is the nearest thing to a cost-of-living index that we have, there has been somewhat the same off-setting movement. In this case it has been food prices which have declined, and

that decline has off-set the rising trends in other segments of the index. The truth of this is provided by the fact that in three of the past five months, food prices have risen, and the index as a whole has risen. The figure for September, which was made public last Friday, made a new all-time high.

I do not anticipate a rapid rise of prices. But I am convinced that the next major move of the indexes will be on the up-side. We can not afford a continuation of this trend. Fortunately the Administration is dedicated to bringing inflation to a halt, and so is the Federal Reserve Board. They both deserve our support on this issue.

I already have mentioned the need for tax rate reform. Our present tax system could scarcely be worse. If the public becomes aroused here is a possibility that something can be done in the coming session of the Congress on taxes.

We just got a labor reform bill through the Congress. It is a good bill, but it does not touch the basic issues of the labor problem. At the moment, however, there is no reason to assume that a further bill can be passed in the near future.

Those are the main problems as I see them. Now how does one stack these up against the recovery which I covered in the first part of my comments?

Here, then, are my conclusions:

For the remainder of this year we shall have good business. Just how good it will be will depend in large measure upon when and how the steel strike is settled. But the balance of 1959 is pretty well in the bag.

The first half of 1960 also looks like good business. It will take at least that long fully to recover from the recent set-backs we have had, and further this still is a relatively young recovery.

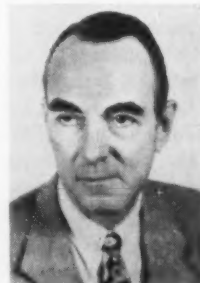
Beyond the middle of 1960 is not so clear. Recovery should continue throughout the year, but my crystal ball becomes hazy beyond July, 1960. I would rather say that it is more than probable that the length of the recovery will depend in large measure upon the success with which we solve the problems I have outlined. If we solve them, recovery can continue almost indefinitely; if we do not solve them, we may wake up any morning a few months hence and wonder what hit us in the face.

Gentlemen, this is the time to go to work. If we will all do that, there is a truly great future ahead of us.

## About the Author

R. ROBESY, economic advisor to the National Association of Manufacturers, is a nationally known economist, editor and author and is a professor of banking at the University of South Carolina. Dr. Robesy graduated from the University of Indiana in 1920, subsequently obtaining his master's and doctor's degrees at Columbia university.

Simultaneously with his teaching activities Dr. Robesy was financial editor of the New York Evening Post from 1931 to 1933, contributing editor of the Washington Post from 1933 to 1935, and associate editor of Newsweek magazine from 1937-38. He is the author of several books on banking, real estate, and various economic subjects.





# NLGI 1959-60

## Officers and Board of Directors

President



H. A. MAYOR, JR.  
*Southwest Grease and Oil Co.*

Vice-President



F. R. HART  
*Standard Oil (California)*

Secretary



C. L. JOHNSON  
*Jesco Lubricants Co.*

Treasurer



A. J. DANIEL  
*Battenfeld Grease and Oil Corp., Inc.*

Officers and directors for the forthcoming year were elected at the National Lubricating Grease Institute's 26th annual meeting, in New Orleans at the Roosevelt hotel, October 25-28. H. A. Mayor, Jr., Southwest Grease and Oil is the Institute's 27th president. F. R. Hart, Standard Oil (California) is vice-president. C. L. Johnson, Jesco Lubricants is secretary, and A. J. Daniel, Battenfeld Grease and Oil is serving his eighth consecutive term as treasurer.

Elected to the NLGI board of directors for three year terms were W. W. Albright of Standard Oil (Indiana), T. W. Binford of D-A Lubricants, J. J. Coates of Esso Standard, G. Landis of Atlantic, J. W. Lane of Socony Mobil, G. E. Merkle of Fiske Brothers Refining, and W. M. Murray of Kerr-McGee.

F. W. Minor of Sinclair Refining was elected to a two-year term, to complete the vacancy created upon the death last spring of the late A. S. Randak, also of Sinclair.

Mayor, executive vice-president of Southwest Grease and Oil company of Wichita, has been a director of NLGI since 1953 and has chairmanned a number of important committees. This past year he served as the Institute's vice president and program chairman. Hart is supervisor, industrial and marine lubricants, Standard Oil company of California (Western Operations, Inc.) in San Francisco and has served on the governing body since 1955.

Johnson, president of Jesco Lubricants company in North Kansas City, Missouri, has served on the board since 1953. A. J. Daniel is serving his eighth consecutive term as treasurer of the technical association, after having been president (1949) and a director since 1945. He is president of Battenfeld Grease and Oil company of Kansas City.

Other directors, elected in other years for three year terms and now serving on the board, include: S. C. M. Ambler of British American, E. W. Campbell of Gulf Oil, R. Cubicciotti of L. Sonneborn Sons, A. J. Daniel of Battenfeld (Kansas City), F. R. Hart of Standard Oil (California), C. L. Johnson of Jesco Lubricants, W. A. Magie, II of Magie Brothers, H. A. Mayor, Jr., of Southwest, G. A. Olsen of Sunland, F. E. Rosentstiel of Texaco, W. H. Saunders, Jr., of International Lubricants, T. F. Shaffer of Shell Oil and A. G. Griswold, Cities Service.

## New Technical Committee Structure

Technical committee structure has changed with the retirement of T. G. Roehner, longtime chairman (see *Honors* story), who is leaving the position after a twelve-year stewardship. Assuming the position of Technical committee chairman is L. C. Brunstrum, Standard Oil company (Indiana), at Whiting. A vice-

## Newly Elected Directors ...\*



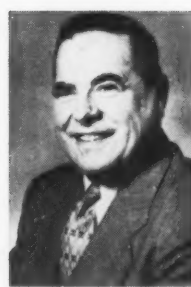
**W. W. ALBRIGHT**  
*Standard Oil (Indiana)*



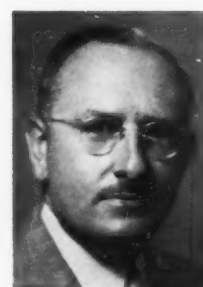
**T. W. BINFORD**  
*D-A Lubricant Co.*



**J. J. COATES**  
*Esso Standard Oil Co.*



**G. LANDIS**  
*Atlantic Refining Co.*



**J. W. LANE**  
*Socony Mobil Oil Co., Inc.*

\* F. W. Minor not shown.

## Technical Committee



**G. E. MERKLE**  
*Fiske Bros. Refining Co.*



**W. M. MURRAY**  
*Kerr-McGee Oil Industries, Inc.*



**L. C. BRUNSTRUM**  
*Chairman*



**M. J. POHORILLA**  
*Vice-Chairman*



**M. L. CARTER**  
*Vice-Chairman*

chairman since 1955, Brunstrum has been particularly active in NLGI affairs and served on a number of technical sub-committees. He was the sixth man to receive NLGI's "Award for Achievement."

Assisting as vice chairmen will be M. J. Pohorilla of

Kendall Refining Company, Bradford, Pa., and M. L. Carter of Southwest Grease and Oil company, Wichita. Like the chairman, these men have been active in the Institute and all three men have been frequent contributors to the NLGI SPOKESMAN.

## NLGI Honors Two of Its Outstanding Men

Two men were honored in New Orleans at the annual meeting . . . both have given of themselves over the years that the National Lubricating Grease Institute might progress . . . W. H. Saunders, Jr., and T. G. Roehner, as founder and technical committee chairman, respectively.

A technical association organized for development of better lubricating greases for the consumer and better engineering services for industry . . . those were the aims of the founders of NLGI when it was formed in 1933. Today, the scope of the Institute keeps enlarging beyond those important needs by the work of



**T. G. ROEHNER**



**W. H. SAUNDERS, JR.**

a growing number of technical and marketing committees, manned by research and marketing men of the industry.

NLGI history shows that Guy Peters, chairman of the board of Oil-Kraft, the late C. R. Battenfeld of

Battenfeld Grease and Oil, and W. H. Saunders, Jr., of International Lubricants, were generally credited with organizing NLGI. Today, with Mr. Peters in semi-retirement, W. H. Saunders, president of International, remains the only active founder and has begun his 26th year as a member of the board of directors of the Institute he helped originate.

With the annual meeting in Mr. Saunders own community it was the unanimous decision of the awards committee to honor him with the "NLGI Award for Achievement" during the 27th annual meeting in New Orleans, for his quarter-century of service on the board.

#### Twenty-Five Years of Effort

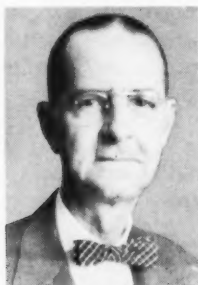
The seventh man to receive this industrial award, Mr. Saunders has listed a number of contributions over the years, beginning with his offer of a provisional constitution and by-laws at the first meeting in 1933. Election to the board of directors followed in 1934, with the subsequent chairmanship of, or participation in, every committee ever formed by the Institute. In 1935 he served as NLGI's third president.

T. G. Roehner, manager of the technical service division, research department, Socony Mobil, has served twelve years as chairman of the technical committee. One of two men to first receive the NLGI "Award for Achievement" in 1952, Roehner holds the distinction of having been specifically requested by each succeeding president of NLGI to continue to serve . . . a change of corporate responsibilities and his own conviction that it was time ". . . for new blood" brought about his retirement from the post.

Through the years these men have seen and assisted the Institute's growth—research programs, dissemination of technical data, coordination with other technical organizations, and publishing methods of application are other phases of activity, with an annual meeting in October which continues to grow in scope and coverage.

The 25th anniversary of board service and twelfth year of chairing the technical committee are two more reasons for the strength of the Institute, and the NLGI SPOKESMAN would like to join with the membership in saluting W. H. Saunders, Jr., and T. G. Roehner. ■

## Recognition of Services Rendered



J. V. STARR



A. S. RANDAK



T. G. ROEHNER

Service in an organization is its strength and in that regard, NLGI has always been fortunate . . . board members are part of working committees and the technical committee group has traditionally tackled its tasks with care and precision. Thus, when retirement or change in duties make a resignation necessary, it is with a sense of loss that they are accepted. Men who have given of their time and talents in Institute affairs who will be relinquishing positions include:

*J. V. Starr*, of Esso Standard Oil company, a director since 1954 and secretary of NLGI this past year. Retirement has brought Dr. Starr's activities to an end

with NLGI. An active committee worker, he headed the group which established the production survey.

*A. S. Randak*, of Sinclair Refining company, a director elected at the 1958 annual meeting, died in early May. He had been chairman of the chassis lubrication committee.

*T. G. Roehner*, of Socony Mobil Oil company, has been forced to give up his NLGI duties because of a change of responsibilities. He has served as chairman of NLGI's technical committee for twelve years.

Speaking for the membership, the journal would like to express appreciation for the efforts of these men.

# What's Wrong With Motor Oil Sales and What to Do About It

By: R. Cubicciotti  
L. Sonneborn Sons, Inc.

*Presented at the IOCA 12th annual  
meeting in Chicago, September, 1959*

EDITOR'S NOTE—Although the following article deals with motor oil drain periods to the exclusion of lubricating greases, because the two operations frequently occur together, the problem of infrequent motorist attention is shared. A former president of the Institute is active in trying to change the declining ratio of oil-gasoline for the American Petroleum Institute's Lubrication Committee and his report on the work of the first year is given below. NLGI's new Chassis Lubrication Committee is currently evaluating methods by which the motorist's attention can be brought to proper chassis lubrication intervals and their recommendations will be made public to the membership in the near future.

The problem, which has been with us over 25 years, is the constantly slipping motor oil-gasoline ratio. (It has slipped 25 per cent in the last six years.)

The problem has grown increasingly difficult in recent years, because of the diversity of oil drain recommendations coming out of Detroit, and the resultant confusion in the minds of motorists and service station personnel.

You can imagine that the trend has received serious attention in the oil industry, by usually on a company-by-company basis. In May 1958, at its meeting in New Orleans, the General Committee of the API Division of Marketing adopted the recommendations of its Lub-

ricating Committee, which were to make a three-pronged attack upon the problem, as follows:

A. A direct approach to be made to the consuming public, by means of a publicity reporting service.

B. An approach to the car manufacturers, in an effort to get them to make more reasonable oil drain recommendations.

C. An exchange of information as between interested marketers of motor oil, to show what the industry is doing about the problem on an individual basis. (We have nick-named this part of the program "Operation Bootstrap.")

Early in the game, it became evident that we in the industry had to rebuild our own confidence in the technical correctness of our oil drain recommendations. Actually, there has been a great deal of work done by various oil companies, directed to this point, but too little of it is publicized.

Here are two exceptions:

Standard Oil Company did some work relating surface ignition to oil drain practices. The work showed that the incidence of surface ignition was five times greater with used oil than with new oil.

Even more interesting, they showed that if this used oil were transferred to a new engine, the increase in surface ignition was abnormally rapid. The Lubrizol Company, in a test involving 81 taxicabs, selected 1500 miles and 6000 miles as representative of the extremes in oil drain practice. To their surprise, they found that even 1500 miles was too far, as judged by sludge and varnish deposits in the engines.

This evidence, plus countless other corroborating facts, served to reaffirm our faith in regular, frequent, oil drains. It was also apparent that the then-existing API Oil Drain Recommended Practice was a bit confusing to some people and could stand some dressing up and "sloganizing."

Work was done on this phase of the problem, and in May of this year, at its meeting in Des Moines, the General Committee of the API Division of Marketing unanimously approved a new short version of its oil drain recommendation, as follows:

*Drain Crankcase Oil—  
In Winter—Every 30 Days  
In Summer—Every 60 Days  
But Never to Exceed 2000 Miles*

And now that a ground-work has been laid, let us see how we have come along in our three objectives:

#### A. The Publicity Reporting Campaign:

This was deliberately withheld until the present time, because we wanted to be sure that the API Simplified Oil Drain Practice Recommendations were taking hold in our own industry, before broadcasting them.

I am happy to report a conclusive trend toward the use of the Simplified Recommendations in our industry, and consequently, we are starting the publicity reporting campaign immediately.

I can express the hope that, in 1960, all the articles you see in the public press will not be adverse to good oil drain practice.

#### B. The Approach to Detroit:

This has been under way since this Spring, and is continuing.

In preparation for these contacts, the American Petroleum Institute conducted a survey among 2000 new car dealers, in order to learn their attitudes toward regular and frequent crankcase drains.

The results are too voluminous to report in any detail here, but the real meat of the survey is contained in these statements:

1. Car dealers reported that their manufacturers recommended oil changes on the average of every 2846 miles.
2. Car dealers reported that they themselves recommend oil changes on the average of every 1833 miles.
3. Car dealers reported that they would favor more uniform oil change recommendations, on the average of every 1700 miles.

From this, the following encouraging deductions can be made:

1. Regardless of what Detroit says or does, motor oil can still be sold to the American motorist.
2. The car dealers represent a mighty force in preventing Detroit from going to ridiculous extremes in recommending longer and longer drain periods.

(Presently, the API is conducting a similar survey among consumers.)

The results of the car dealer survey were revealed to responsible officials in the motor car industry (as will the results of the consumer survey). It is hard to assess the results of these contacts to date, but this can be said:

The oil drain recommendations for the 1960 cars (as available up to this time) are much more like the API Simplified Recommendations than we had any right to hope for.

#### Examples:

Cadillac	Winter—2000 miles or 30 days Summer—4000 miles or 60 days
Chevrolet	4000 miles. For trips of less than 10 miles— Winter—30 days Summer—60 days
Chrysler	2000 miles or 2 months



### C. Operation Bootstrap:

Since last December, the Motor Oil Study Panel has issued eight bulletins, to which were attached hundreds of examples of how individual members of the industry are fighting a declining motor-oil gasoline ratio.

In analyzing the contents of these bulletins, we can categorize them as follows:

#### Category No. 1

##### *Direct Consumer Advertising*

The dominant theme here is the need for regular and frequent oil drains with a secondary theme emphasizing the severity of stop-and-go service, which all too many motorists consider to be mild in nature.

What we are talking about here are efforts to get the consumer to buy *more* motor oil, and not merely to persuade the consumer to buy a particular brand.

If, as is reported, the petroleum industry spends hundreds of millions of dollars each year for advertising, and if only 1 per cent of the effort were put into attempts to increase the overall consumption of motor oil, you can see what a mighty force this could be.

#### Category No. 2

##### *Dramatizing Motor Oil at the Pump Island*

The chief point behind these various ideas is to pep up the station operators into talking oil drains, as much as it is to gain consumer attention to the need for an oil drain.

#### Category No. 3

##### *Educational Material Directed at the Dealer*

The large volume of such material indicates a wide spread feeling that a lot needs to be done to properly educate the dealer as to the need for oil drains and the techniques for selling them. The profit motive, of course, is stressed.

#### Category No. 4

##### *Educating Non-Selling Employees of Oil Companies*

Here again, a widespread use of house organs for this purpose supports the belief that a large area for improvement exists here. Our own employees, who should be our best salesmen, are often the worst when it comes to oil drain recommendations.

### About the Author

R. CUBICCIOTTI is a vice-president of L. Sonneborn Sons, Inc., one of the charter member firms of NLGI. He was formerly with Union Oil Co. of California, where he was a chemist, supervisor of grease manufacture for seven years and then became technical assistant and later manager, lubri-

cants and special products department. He has served on a number of NLGI committees, has been a director since 1949 and most recently was president in 1957-58. A past chairman of the Lubrication Committee of API's Marketing Division in 1954, he is also a member of the SAE.

### Category No. 5

#### *Technical Articles Supporting the Need for Oil Drains*

These are important to constantly remind all concerned that there is a sound technical basis for our oil drain recommendations. Undoubtedly, the industry has enormous amounts of such data. More of it should be publicized.

### Category No. 6

#### *Brainstorming Ideas for Increasing Motor Oil Sales*

A brainstorming session under API auspices was held in New York in late April. Its subject: "100 Ways to Increase Motor Oil Sales." Its chief findings:

- (a) The consumer is sadly in need of education on the need for regular and frequent oil drains.
- (b) Changing oil must be made a simpler and quicker procedure. Today, it is entirely too time-consuming, and usually means the car is out of circulation for the better part of a day.

### Category No. 7

#### *Publicity Favorable to Regular and Frequent Oil Drains*

There has been no coordinated effort in this regard, but one oil company has been successful in placing favorable articles in the house organs of entirely unrelated industries.

The importance of this is that it represents the type of publicity reporting work which we can do as an industry. These particular articles have to do with the overall care of the car. Naturally, the matter of regular and frequent oil drains receives its share of attention.

Also, our industry's magazines have been playing up the importance of regular and frequent oil drains.

In conclusion and in summary, we can look back on the mandate given to the Motor Oil Study Panel exactly a year ago, and say:

A. The publicity reporting-campaign is under way.

B. The contacts with Detroit are under way, and seem to be bearing fruit.

C. Operation Bootstrap is in full cry, and it provides the clues to what you, as individual marketers, can do for yourselves to help in this battle.



NLGI SPOKESMAN

# Non-Soap Grease III A Systemization of the States of Solids Dispersed in Organic Media

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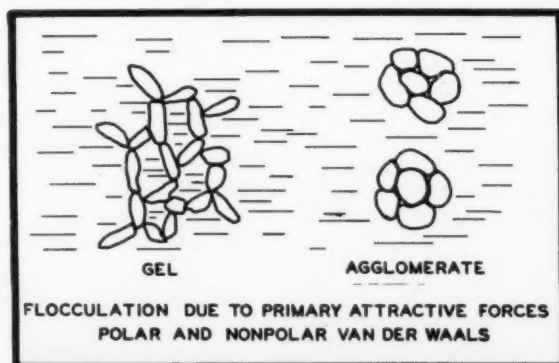


Figure 1

## Abstract

A systemization of the most probable states for solids dispersed in organic media has been made. Specific attention has been paid to the development of more rigorous definition where ambiguity existed previously. Flocculation is discussed in terms of (primary) van der Waals type attractive forces and secondary and tertiary attractive forces. These latter two result from the influence of flocculating agents. Reduced or deflocculation occurs due to steric hindrance, absorbed lyosphere, entropic repulsion or double layer effects.

## Introduction

The initial consistency of a non-soap grease system as well as changes in consistency which occur on standing, high temperature exposure, mechanical working, practical use, etc., depend principally on the forces of interaction (and alteration in these forces) between thickener particles dispersed in the vehicle. To define accurately the effects of externally applied conditions on grease structure, changes in structure must be followed experimentally and the causes of these changes established. A fundamental knowledge of the factors, largely interfacial, important to structure in the wide variety of grease systems which can be formulated is necessary for the understanding of both grease formation and stability. Consequently, a systemization of all the types of systems which might be met in practice and a theoretical analysis of particle-to-particle interaction in such systems is a necessary first requisite. This must be followed by the application of theory to experimental results particularly concerned with stability studies of practical greases either reported in the literature or that which must be performed. Special attention must be paid to the factors responsible for the adsorption from solution of grease components initially present or formed during use since the work properties of a grease and its final rest structure are influenced profoundly by the molecules residing at the interface. All these areas must be considered to develop an understanding of the properties of non-soap lubricating greases.

## Discussion

The combination of attractive forces of the London-van der Waals type and repulsive forces due to the interaction of double layers originating at the solid-liquid interface was sufficient to lead to the development of quantitative theory of the stability of colloidal dispersions, principally hydrosols and has been discussed adequately elsewhere<sup>1</sup>. Double-layer theory, so

successful for media of dielectric constant five or greater, has been applied only recently to particle-to-particle interaction in nonpolar vehicles<sup>2</sup>, and remains to be tested fully. In addition, nonionic components present in a solid-liquid dispersion either as an additive or impurity may cause reduced flocculation, deflocculation, flocculation, or have no effect depending on type and system. Some of these same effects are operable in dispersions of solids in pure liquids. A systemization of the states of solids in organic media is needed. Known or predicted states for solids dispersed in a variety of pure liquids, or in more complex media containing impurities or additives are summarized in Table I. These descriptions are based on purely theoretical considerations and on experimental findings reported in the literature or of this study.

TABLE I  
Predicted or Known States of Solids in Organic Liquids

Solid	Polarity of Liquid	State of Dispersion	Mechanism	System
1. P, NP	P, NP	Flocculated	Primary (Van Der Waals) Attractive Forces	Many Pure Liquids
2. P	NP	Flocculated	Secondary Attractive Forces	Immiscible Third Component
3. P, NP	P, NP	Flocculated	Tertiary Attractive Forces	Specific Flocculating Agents
4. P, NP 0.01 $\mu$ dia-particles	P, NP	Deflocculated	Entropic Repulsion	(Specific Pure Vehicles)
1 $\mu$ dia. particles		Flocculated		Spec. Non-ionic Additives
5. P, NP 0.01 $\mu$ dia. particles	NP	Flocculated	Double-layer Repulsion	Specific Ionic Additives
1 $\mu$ dia. particles		Deflocculated		
6. P, NP 0.01 $\mu$ dia. particles	P	Deflocculated	Double-layer Repulsion	Specific Ionic Additives
1 $\mu$ dia. particles		Deflocculated		
7. P, NP	P, NP	Reduced Flocculation	Steric Hindrance	Specific Solid-Liquid Systems. Bulky Organic Additives
8. P, NP	P, NP	(Flocculation)	Lyosphere	Pure Liquids
		Deflocculation	Lyosphere	Specific Additive-Vehicle-Solid

P = Polar NP = Nonpolar

The types of flocculation which can occur in solid-liquid dispersions are illustrated in Figure 1. Whether a gel or suspension form (with associated syneresis or settling) depends on concentration and particle di-

ameter of the solid as well as other properties of both phases. Both large and small particles flocculate under the influence of nonpolar (and polar) attractive forces and can approach to an equilibrium distance of minimum potential energy in the absence of chemisorption, oriented physical adsorption of vehicle molecules or other mono-molecular adsorption processes. An equation for the energy of interaction<sup>3</sup> between two spheres of radius  $r$  for London-van der Waals forces is

$$E = \frac{q\pi A}{72} \frac{1}{X^2+2X} + \frac{1}{X^2+2X+1} + 2 \ln \frac{X^2+2X}{X^2+2X+1} \quad (1)$$

where  $d$  is the shortest distance between the surfaces of the spheres,  $X = d/2r$ ,  $q$  the number of attracting molecules per  $\text{cm}^2$  and  $A$  the van der Waals constant. The magnitude of  $E$  depends on the density of the solid particles, particle size as well distance of separation. The attractive forces are long-range compared to intermolecular forces and can be effective at distances of from 10–100 Å reference 1. Obviously the shape, roughness, surface polarity, size and size distribution of solid particles as well as vehicle type profoundly influence particle-to-particle interaction in a manner difficult to assess quantitatively. Never-the-less, a combination of repulsive energies and van der Waals type attractive energies calculated as a function of the distance of approach of two particles has led to the development of theory sufficient to explain many experimental findings.<sup>4</sup>

A large interfacial free energy is the cause of the instability of sols but more definition is needed here. The free surface energy  $\gamma_{SL}$  at the solid-liquid interface is the driving force for flocculation where multimolecular adsorption of vehicle molecules occurs; here the transition from the solid surface, through the adsorbed phase to bulk liquid is continuous. For many systems, even when physical forces alone are operative, the nature of the adsorbed vehicle (or additive) molecules in the monolayer determines the extent of sol stability. For example an oriented, adsorbed monolayer might form. Here the interfacial free energy  $\gamma_{SL}$  between the film-covered solid and the liquid must be considered also. For a given solid dispersed in a wide variety of organic liquids, it will be shown that  $\gamma_{SL}$  has a much more profound influence on the stability of a sol than  $\gamma_{SL}$ . Systems for which  $\gamma_{SL}$  alone is important are discussed in the following section.

#### 1. Flocculation Due to (Primary) Van Der Waals Attractive Forces

Solid-liquid dispersions are not studied under aseptic conditions in general. Extraordinary precautions are too often necessary. The difficulty in removing the very last traces of water—and these may be extremely influential—from organic vehicles has been demonstrated<sup>5</sup>. These difficulties are compounded by the com-

plex experimental operations necessary for dispersion and study of the system in water-free atmospheres. In addition, the presence of small amounts of impurities which may be surface active can be eliminated only with difficulty particularly, with many of the higher-boiling, viscous vehicles of practice. Never-the-less, certain solid-liquid systems have been studied under rigorously controlled conditions or where the influence of additional components can be neglected.

Table II gives an indication of the average wt. per cent (and total interface) of both hydrophobic and hydrophilic solids required to form greases of reasonable initial penetration<sup>6</sup> in a nonpolar vehicle. For example, only about 12 wt. per cent of the polar silica, Aerosil, was necessary to form a grease of penetration 176, whereas 15 wt. per cent of the nonpolar silica Estersil, was required to form a grease of penetration 231 even though the area of Estersil is nearly twice that of Aerosil. That at least trace amounts of water were responsible for structure in the greases containing the polar solids was found in this laboratory by adding small known amounts of  $P_2O_5$  by spatula into previously well-dried systems: fluidization of the grease occurred. The addition of  $P_2O_5$  did not affect the consistency of greases containing G. S. silica, another form of Estersil, or the carbon black Mogul to any significant extent. Obviously, the comparison of the thickening ability of polar and nonpolar solids given in Table II is improper, and it could be inferred that the thickening ability of polar and nonpolar solids might not be so radically different if they were dispersed in pure liquids (where for example only multilayers formed). Indeed, only silica-paraffin oil greases containing at least 30 wt. per cent solids could not be fluidized by addition of  $P_2O_5$ ; this wt. concentration then is a rough measure of the amount of polar solid needed to form a gel in the pure vehicle.

TABLE II  
Thickening Ability of Solids in Paraffin Oil

Solid	Area ( $m^2/g.$ )	Heat of Immersion in water ( $ergs/cm^2$ )	Wt. % Solids	Total Interface $m^2$ 100g. Grease	Penetration $m^2$
POLAR SOLIDS					
Aerosil	160	154	12	1920	176
HiSil	135	460	15	2030	158
Rutile	90	550	25	2240	183
NONPOLAR SOLIDS					
Estersil	290	0	15	4350	231
Carbolac 2	650	90	10	6500	224

Sedimentation volumes might prove useful in assessing the influence of the interfacial free energy  $\gamma_{SL}$  on flocculation in systems where the adsorption processes are similar (multimolecular). Of course much more



sensitive measurements are necessary since the effects on flocculation of different media are in general small. Bloomquist and Schutt<sup>7</sup> found that the sedimentation volumes of dry glass spheres in a series of different liquids were very nearly the same if completely anhydrous conditions were employed. Eggleton and Puddington<sup>8</sup> found small but finite differences in the sedimentation volume of glass spheres in pentane and toluene which were attributed to the influence of  $\gamma_{SL}$ . While sedimentation volumes are not yet a good measure of interaction between particles, efforts are in progress to develop theoretical models to explain these values in terms of coherence of particles as they fall<sup>9</sup>.

Dispersions of nonpolar solids in organic vehicles can be treated often as simple solid-liquid systems even if water is present as a contaminant if the surfaces of the solids are sufficiently hydrophobic. Indeed, the thickening ability of a series of different hydrophobic non-soap grease thickeners has been related to their surface areas assuming the free surface energies of the solids approximately equal<sup>10</sup>. More precisely consistency, was related to the extent of the solid-liquid interface even though some water was known to be present in these systems at least as a trace impurity.

Carbon blacks would at first glance appear to be suited ideally for use as non-soap grease thickeners. These materials are the only ones of a small group of available high area inorganic solids which are readily available, relatively cheap and which can be obtained in a variety of particle sizes. In addition, these solids are low free surface energy solids yet can be obtained with surfaces varying from weakly polar to essentially nonpolar. High area graphites might be more suitable because of their excellent lubricity. Despite these seeming advantages carbon blacks or graphite have not found extensive use as in non-soap greases. Puddington in a summary of the properties of carbon black greases<sup>11</sup> stated that the oleophilic nature of blacks necessitates excessive amounts of solid to give a desired yield value. This in turn leads to undesirable high shear viscosities. In addition the temperature coefficient of yield is large. Oleophilicity or interfacial free energy may not be sufficient however to explain reduced interaction particularly in view of the findings concerning both silica and carbon black greases in water-free vehicles. Puddington does suggest further that reduced particle-to-particle interaction can result in carbon black-nonpolar vehicle dispersions due to a charge build-up on the surface during use. This results from the movement of solid particles under shear since the two components differ significantly in dielectric constant.

## II. Flocculation Due to Primary and Secondary Attractive Forces

The flocculation of particles having on their surface one or more monolayers of an adsorbed component which is immiscible in the dispersion vehicle has been studied by Kruyt and van Selms<sup>12</sup>, e.g., polar solid-

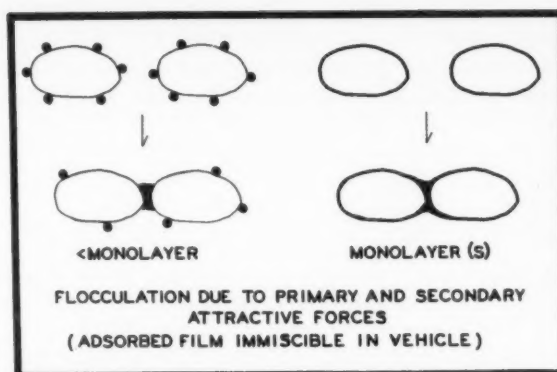


Figure 2

nonpolar liquid dispersions; water added. The high interfacial tension between the adsorbed water-vehicle interface is reduced markedly by coalescence of water covered particles as shown in Figure 2. The area and free energy decreases have been estimated for dispersions of glass spheres by these workers, and obviously are much more significant here than for systems where free energy changes attendant on the close approach of solid particles only occur. In terms of energies, the polar and nonpolar van der Waals faces between adsorbed water molecules (these are called secondary for convenience) as well as between atoms in adjoining particles must be considered. The attractive minimum in the total interaction energy curve would be much lower for the coated particles than the uncoated and decreases further as the number of adsorbed layers increases.

Confirmation that even trace amounts of water play an important role in the formation of structure was found by adding small known amounts of  $P_2O_5$  by spatula into well-dried greases made from silicas in nonpolar vehicles whereby a marked breakdown in structure occurred. These dispersions became too fluid for penetrometer measurements. However, the gel structure returned on standing about 24 hours. Anhydrous  $MgSO_4$  also causes breakdown in gel structure and for periods of several weeks even if the grease was exposed to atmospheric conditions. The most likely explanation is that the drying agents combined chemically with the trace amounts of water available for flocculation. The formation of structure by trace amounts of water—perhaps even a few molecules per bridge between the solid particles seems to occur. Certainly in the very stringently dried systems only fractional water layers, far below a monolayer, could have been adsorbed. This mechanism, of course, requires mobility of adsorbed water molecules to junction points between particles.<sup>5</sup>

It is interesting to note that another immiscible liquid besides water has been found to cause a sharp increase in consistency of a grease thickened with the polar solid, Aerosil. Ethylene glycol thickened Aerosil



—Plexol 201 greases in much the same manner as did water. Evidently, here also flocculation is increased as the concentration of ethylene glycol is increased due to coalescence of particles and the reduction of interfacial tension between adsorbed ethylene glycol and the vehicle although multimolecular effects were absent. Other immiscible liquids with the high interfacial tensions measured against the vehicle, and which are adsorbed by the solid, cause flocculation by this same mechanism. Low molecular weight multifunctional or-

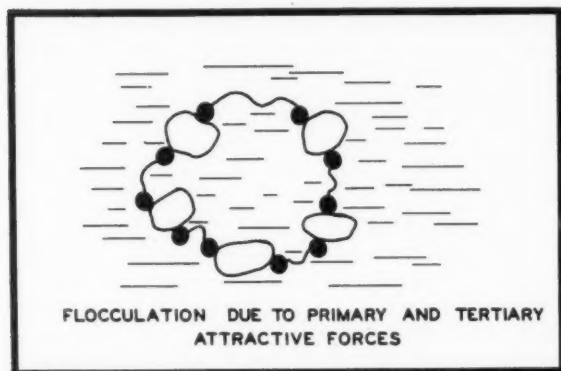


Figure 3

ganic compounds are particularly effective thickening agents<sup>13</sup> for these type of systems. Obviously, from the results described here and in the following sections  $\gamma_{sl}$  is much more important to the final state of dispersion than  $\gamma_{sl}$ .

### III. Flocculation Due to Primary and Tertiary Attractive Forces

That certain substances can act as flocculating agents is well known. Dintenfass<sup>14</sup> noted that many multifunctional compounds such as triethanolamine, ethylene diamine, citric acid, etc., act as flocculating agents in a manner similar to that shown in Figure 3. Adsorbed immiscible surface films cannot be discounted here, however. Arnold<sup>15</sup> found that palmitic acid acted as a flocculating agent at low concentrations in carbon black-paraffin oil dispersions, but reduced flocculation at high concentrations. Overbeek's<sup>16</sup> earlier mechanism which requires acid molecules to contact adjacent solid particles at low concentrations was employed: steric protection leads to reduced flocculation at higher concentrations. Never-the-less in this instance also, the mechanism of flocculation is not clearly defined. Zettlemoyer and Skewis<sup>17</sup> studied the system calcium sulfonate of dodecylbenzene-graphon-water-cotton and found that the calcium ion enhanced dirt (graphon) deposit by bridging two sulfonate groups attached to the aromatic nucleus adsorbed on each of the two surfaces. There are undoubtedly other examples of flocculation caused by tertiary attractive forces. Certainly the parameters governing adsorption from solution need to be understood here.

### IV. The Lyosphere

Lyospheres surrounding a solid dispersed in a pure liquid or a solution are shown in Figure 4. Definition is needed in this area also. Lyospheres, here are associated with multimolecular adsorption, a continuous transition from the solid surface through the adsorbed phase to the bulk solution, and the interfacial free energy  $\gamma_{sl}$  is the important factor in sol stabilization. Simple systems which exhibit such properties are those where multimolecular adsorption of the vehicle occurs when the solid is exposed to its saturated vapor. Examples are numerous, e.g., water on most polar solids, hydrocarbons or graphitic substances, etc. Sol stability for such systems is unlikely in the absence of other stabilizing effects. Vehicles which have high wetting for solids have been assumed to be more effective in preventing flocculation. Care must be used in the use of the term wetting, however, since comparisons can be made only if the adsorption processes are similar. For example, a lyosphere as defined above may form around an oxide particle in water, where-as an oriented, monolayer can be adsorbed, particularly if a polar solid is activated, when dispersion takes place in a pure, n-polar paraffinic liquid such as an aliphatic alcohol or amine. This latter effect is termed steric hindrance and discussed in the next section.

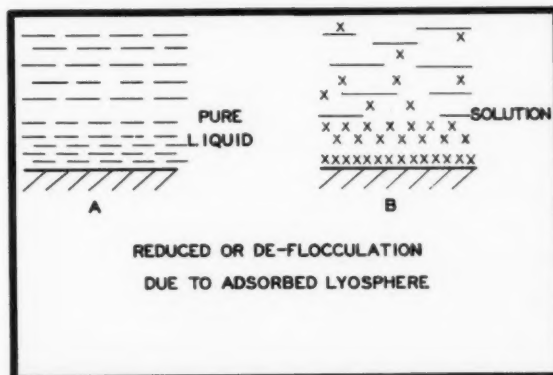


Figure 4

Figure 4b illustrates the formation of a lyosphere by mixed adsorption onto a surface from solution. Ross<sup>18</sup> explains decreased flocculation of non-soap grease thickeners in dioxane containing water as an impurity compared to pure dioxane. Preferential adsorption of the water takes place, but since water and dioxane are completely miscible there is no interfacial tension between the adsorbed layer and the surrounding medium. The solid-liquid interface originally larger between the polar solid and nonpolar dioxane has been reduced by the adsorption of water. Net result is the reduction in the original surface energies and a decreased tendency towards flocculation. The same effect was noted for silica-ethylene glycol gels at Lehigh. Structure formation occurred only on drying the vehicle.

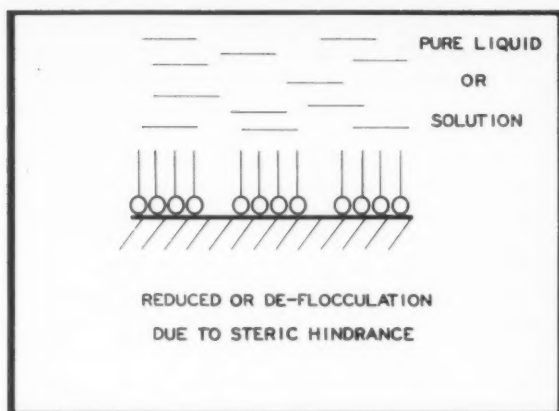


Figure 5

#### V. Steric Hindrance

Protection of sol particles by steric hindrance is illustrated in Figure 5. Steric hindrance is restricted here to monolayer adsorption where  $\gamma_{STL}$  must be considered in judging stability of dispersed particles. This situation develops when activated rutile ( $\text{TiO}_2$ ) is dispersed in *n*-propyl alcohol<sup>19</sup>. Chemisorption on dehydroxylated Ti-O-Ti sites on rutile accounts for the formation of this type of film by a liquid which because of this behavior has been termed autophobic by Hare and Zisman<sup>20</sup>. Such films also undoubtedly form in solution through physical forces of adsorption with oriented closepacking, independent of the substrate. Here the normal polar paraffinic compounds must be sufficiently long so that strong cohesion develops between adsorbate molecules. Adsorption leads to the formation of a stable, low free energy surface. Indeed, non-spreading wetting of the liquid on the newly formed surface film can result if the surface tension of the liquid is high enough and that of the film is sufficiently low<sup>20</sup>.

The degree of protection offered by adsorbed, oriented, long-chain compounds depends on a number of factors: the size and density of the solid particles, the length and density of packing of the adsorbate on the surface, the strength of interaction of the polar portion of the adsorbate with the surface and the magnitude of lateral interactions between adsorbed molecules. Estersil, a surface-coated, hydrophobic fine silica is a good example of a particle having built-in steric protection. In this case, hydroxyl groups on the surface of a hydrophilic silica were chemically reacted with an alcohol containing about four carbon atoms to produce a close-packed outer layer prior to use in colloidal dispersion. Even though the particles of Estersil are very small (dia.  $\sim 0.01 \mu$ ) this material had utility as a thickener. The thickness of the adsorbed layers is insufficient to prevent approach of the particles within the sphere of the van der Waals attractive forces.

Because the magnitude of the van der Waals' attractive forces depends on particle size, and also on the number of atoms per unit volume of the particle, the strength of the chain floccules for Estersil particles is very likely less than for the silica particles. This is so since the organic coating prevents close approach of the more dense silica portions of the particles by steric hindrance and because the organic layer is less dense than silica. This reduction in density is not unexpected for adsorbed organic films and is accentuated by the inability of the chemisorbed organic alcohol to close-pack on the silica surface because of steric and other factors. If the organic molecules were not chemisorbed, the approach of two coated silica particles to an equilibrium distance of separation could cause desorption of the organic layer unless very strong physical adsorption occurred. Water resistance would consequently be lost.

#### VI. Sol Stabilization and Entropic Repulsion

Until 1951 no satisfactory quantitative explanation had been advanced to explain sol stability of colloidal dispersions in certain (organic) vehicles. Experimental evidence showed that aromatic molecules substituted with long aliphatic chains have a profound stabilizing effect on carbon black dispersions in these liquids or their solutions<sup>21</sup>. It was assumed that the aliphatic chains fixed to the surface of the black by the aromatic nucleus but otherwise free, exert a repulsive force when two particles approach each other and thereby prevent flocculation. Mackor<sup>22</sup> showed that the repulsion is due to the decrease in the number of possible configurations of the adsorbed chains when two particles approach one another; a certain amount of work related to the decrease in entropy of the ordered over the disordered state must be done.

Mackor proposed a model consisting of two parallel plates on which a rod-shaped molecule was adsorbed (Figure 6a). Assuming an idealized mono-layer adsorbed over equidistant active sites and neglecting adsorbate-vehicle interactions the free energy of repulsion (Gibbs) was shown to be:

$$\Delta F_R = N_R kT \theta \ln (1-d/b) \quad (2)$$

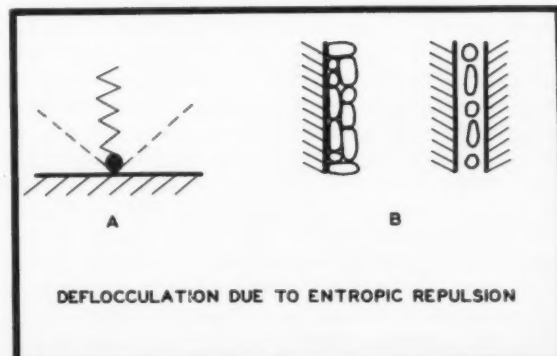


Figure 6

where  $N_s$  is the number of adsorbed molecules per unit area,  $\theta^\infty$  the surface coverage when the distance  $d$  between the two plates is equal to infinity,  $b$  is the length of the chain attached to the surface by a Ball type joint. Calculations show that  $\Delta F_R$  can be several times  $kT$  for suitable systems. When the repulsive free energy is combined with the van der Waals-London free energy of attraction a rod of 20Å stabilizes, whereas with a rod of 10Å rapid flocculation occurs. Mackor and van der Waals<sup>23</sup> also developed a more sophisticated theory including interactions with vehicle of solute molecules to explain stabilization by rod-shaped adsorbate molecules and spherical solvent molecules (Figure 6b). Quantitative use of this theory for practical systems is difficult, but theory has shown that stabilization can occur by this mechanism.

Theoretical considerations have led to the conclusion that large particles ( $1\mu$  and coarser) dispersed in vehicles cannot be stabilized by entropic repulsion<sup>24</sup>. Repulsion operates only when two chains interact. The depth of the resulting minimum in the van der Waals attractive potential energy curve at a distance of 40Å (a reasonable assumption for twice the effective surfactant length) was calculated and compared to  $kT$  in Table III. Since a potential energy barrier of  $15kT$  is required for sol stabilization<sup>2</sup> it is obvious that only small particles ( $10^{-5}$  cm.) can be stabilized, whereas the large particles cannot, even at large distances of separation. As these large particles move together, desorption probably occurs if the adsorbed film is influenced by physical forces only. Chemisorption of molecules onto specific sites on the surface of large particles could impart a measure of stability, in part or wholly steric in nature.

Van Der Waarden<sup>21</sup> has shown that aromatic hydrocarbons with sufficiently long aliphatic chain (s) may stabilize carbon black dispersions in a nonaromatic medium. Aromatic nuclei are adsorbed at the surface of the carbon black due to an interaction between chemically bound oxygen on the small diameter ( $\sim 0.03\mu$ ) carbon black surface and all partial dipoles of the aromatic rings. He found that the addition of non-aromatic compounds, and aromatics with small or no alkyl side chain, to carbon black in mineral oil, produced little or no stabilization. Aromatics with side chains greater than eight carbons in length produced appreciable stabilization, the stabilization increasing with the length of the side chain up to sixteen carbons. He also found that flocculation increased in most cases upon heating for one hour at  $100^\circ\text{C}$ . to remove adsorbed water or other materials.

Bondi and Diamond<sup>25</sup> studied the effect of surface-active substances (basic) on the deflocculation of acidic and neutral carbon blacks in hydrocarbon oils. They found that the amount of surface active agent necessary for maximum deflocculation was much less than a

monolayer in the case of the acidic carbon black, but close to a monolayer in the case of the neutral carbon black. Also, complete deflocculation of the neutral carbon black was not always obtained. An increase in temperature increased the flocculation of the neutral carbon black, but only increased the degree of flocculation slightly in the case of the acidic carbon black. Steric hindrance cannot be overlooked as a factor in stabilization of the neutral black. From the above results, it might be concluded that a strong force of interaction must exist between adsorbate and adsorbent in order for entropic repulsion to have its maximum effect. This would occur when a basic surfactant is added to an acidic carbon black, and maximum deflocculation would occur at coverages less than 70 per cent depending on the length of the surfactant side chain. A small increase in temperature, in the case of acidic carbon, decreased flocculation slightly, and further increases in temperature increased flocculation. This would be in agreement with equation 2 where an increase in temperature increases  $\Delta F_R$ . At high temperature, the lifetime of the molecule on the surface, and consequently  $N_s$ , would decrease, thereby decreasing  $\Delta F_R$ .

TABLE III

Van Der Waals Attraction Between Spheres of Radius  $a$  at a Distance of 40 Å Between the Surfaces

Van Der Waals Constant, $A$ , ergs	$V \text{ min. } / kT$		
	$a=10^{-4}\text{cm}$	$a=10^{-5}\text{cm}$	$a=10^{-6}\text{cm}$
$10^{-12}$	510	42	1.2
$10^{-13}$	51	4.2	0.1
$10^{-14}$	5.1	0.4	0.01

H. Koelmans, *Philips Res. Rpt.*; 10, 161 (1955)

Koelmans<sup>24</sup> studied sedimentation volumes and settling times for a variety of polar solids in xylene and concluded that only slight stabilization was offered to large diameter particles ( $R1\mu$ ) by the adsorption of long-chain alcohol and acids. Stabilization increases with increased chain length but goes through a maximum for  $C_{10}$ ,  $C_{14}$  and  $C_{18}$  acids. Koelmans suggest formation of a second layer of adsorbed molecules, an unlikely possibility. Rather it seems likely that entropic repulsion increases with increasing chain length and increasing coverage  $\theta$ . Once  $\theta$  becomes sufficiently large so that neighboring adsorbed molecules interact and reduce the number of possible configurations, entropic repulsion must decrease and stability is reduced. Steric hindrance thereon becomes important.

The ability of certain heptyl derivatives to fluidize greases containing small diameter silicas ( $R0.02\mu$  diameter) in nonpolar vehicles was observed in this laboratory: entropic repulsion appears to be the most probable mechanism. The amine and alcohol are particular-

ly effective thinning agents and at concentrations as low as 2 wt. per cent in Aerosil-paraffin oil greases. The acid, aldehyde and chloride, however, had little influence on the consistency of this grease system. Even large quantities of the acid (up to 12 wt. per cent) cause only small decreases in consistency whereas similar quantities of the chloride had no effect.

Factors governing adsorption from solution for most systems are generally not well understood. Since all the heptyl compounds are miscible with the vehicle paraffin oil, the relative equilibrium concentration, i.e., the ratio of the equilibrium concentration to the concentration of a saturated solution at the adsorption temperature, cannot be used as a criterion to predict adsorption. Heat data are useful here, however. The important variables governing adsorption from solution are the heats of wetting of the solid by the pure additive liquid compared to the pure vehicle, which in turn depend on the polarity of the solids and liquids. The heat of solution of the additive which measures the degree of affinity between the solute and solvent must also be considered. Lastly, the presence of impurities such as water cannot be overlooked when polar solids are used in nonpolar vehicles.

The consistency changes of Estersil-paraffin oil greases on the addition of the heptyl components is quite different from those found with greases formulated with polar solids. Rather small, linear decreases in consistency are observed as additive concentration increases up to a given weight per cent of additive; beyond this concentration further additive addition has little effect. All the additives were effective although to a different degree, and in no instance was fluidization (complete deflocculation) observed. These results can be explained by postulating adsorption of the heptyl compounds on the rather few and isolated polar sites on the surface of Estersil. Because Estersil has a large surface concentration of chemisorbed, butyl chains, the adsorption heptyl compounds must be wedged between these groups. Since the heptyl compounds are much longer than the butyl groups on the original Estersil surface, the van der Waals forces of attraction between particles containing adsorbed heptyl compounds are reduced and the decreases in consistency found are normal.

#### VII. Electrical Repulsion

The close-relationship between electric charge and sol stability has been recognized long ago, and indeed, has led to the development of quantitative theory successful for hydrosols. Progress in development of theory for media of low dielectric constant (5 and lower) was slow principally because of the experimental difficulties encountered in measuring surface potentials. The experiments of van der Minne<sup>26</sup> showed that sufficiently large surface potentials can exist to ac-

count for sol stabilization in certain systems of this type.

Verwey and Overbeek<sup>27</sup> derived the equation:

$$V_R = \frac{\gamma^2 \epsilon_0 \Sigma}{R} = \frac{\epsilon a \exp(-\kappa(R-2a))}{R} \quad (4)$$

When  $\gamma_0$  is the surface potential,  $\Sigma$  the dielectric constant,  $a$  the particle radius,  $R$  the distance between the center of two spherical particles and  $\kappa$  the Debye characteristic length. In hydrocarbon oils ionic concentrations use of the order of  $10^{-10}$  N corresponding to a value of  $1/\kappa$  of about  $5\mu$ . For such large values, equation 4 simplifies to:

$$V_R = \frac{\gamma^2 \epsilon_0 \Sigma a}{R} \quad (5)$$

which is Coulombs law and suggests no screening of surface charge by counter-ions.

TABLE IV  
Maximal Repulsion As A Function Of Particle Size  $a$  And Surface Potential  
( $A = 10^{-12}$  ergs)

mV	$V_{max.} / kT$		
	$a=10^{-4}cm.$	$a=10^{-5}cm.$	$a=10^{-6}cm.$
25	13	—	—
35	26	1	—
50	62	4	—
75	152	11	—
100	286	20	1
150	662	54	4

H. Koelmans, *Philips Res. Rpt.*; 10, 161 (1955)

By combining the electrical repulsion with van der Waals attraction according to Eq. 1 the maximum repulsion was calculated as a function of particle size and surface potential by Koelmans<sup>21</sup>. These values are tabulated in Table IV. These data indicate that particles of

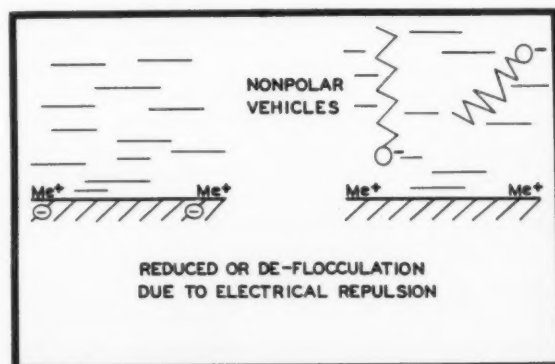


Figure 7



large diameter ( $1\gamma$ ) can be stabilized by a charge of the order of 25-35 mV, the order of magnitude found experimentally. Small particles cannot be stabilized according to theory. As solution concentration increases  $1/K$  must decrease with consequent double compression and reduced stabilization.

Figure 7 illustrates reduced or de-flocculation due to electrical repulsion. A solid may bring into a medium, its own surface charge, e.g. surface exchange sites. This may be explanation of the findings of Puddington<sup>11</sup> who studied the yield of greases prepared from silicas precipitated at various pH's. A maximum in the yield of grease was obtained with silica precipitated at pH=5, the isoelectric point of silica. Significant decrease in yield value of grease samples was observed with silicas precipitated on either side of this value indicating a less flocculated system.

Stabilization by ionic additives requires a compound containing a long organic anion soluble in the medium of low dielectric constant and a small adsorbable cation. It appears that adsorption of the small cation onto the surface proceeds via an exchange type mechanism and on specific surface sites, since physical adsorption of the van der Waals-London type is unlikely for a small ion of low polarizability. Consequently, not all solids would be expected to be stabilized by electrical charges.

Koelmans<sup>24</sup> studied sedimentation volumes of the polar solids,  $\text{Fe}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{BaSO}_4$  and  $\text{SiO}_2$ , in xylene containing copper oleate or commercial ionic additives. The particles were large, about  $1\mu$  in diameter. Settling times as long as several days were observed now. Contrast this to minutes or a few hours for the same systems stabilized with non-ionics (Sec. VI). Critical potentials were calculated from the Huckel equation to be 30 mV, in excellent agreement with experimental findings. Apparently, stabilization by electrical charge can be expected in media of low dielectric constant, but more work in this area is needed.

If the dielectric constant of the xylene was increased slightly by adding methyl alcohol, even the non-ionic acid dissociated sufficiently to show electrophoresis and yielded settling times of several days with these dispersions.

## About the Author

DR. J. J. CHESSICK, research assistant professor of chemistry of the William H. Chandler Chemistry Laboratory, Lehigh University, Bethlehem, Pennsylvania, received his BS degree from Pennsylvania State college in 1948. He received his MS degree from Le-

high university in 1950 and his PhD in physical chemistry in 1952. He has been particularly active in physical-organic study of sulfones and sulfoxides; adsorption and calorimetric studies of solid surfaces; fundamental and applied study of lubrication phenomena.



## Acknowledgment

This work was performed under Air Force Contract AF33(616)-3999 under the monitorship of the materials Laboratory, Wright Air Development Center, Wright-Patterson Air Force Base 1, Ohio.

1. E. J. Verwey and J. Th. Overbeek, *Theory of the Stability of Lyophobic Colloids*, Elsevier Publishing Co., Inc., Amsterdam, Holland, 1958.
2. H. Koelmans and J. Th. G. Overbeek, *Disc. Faraday Soc.*, No. 18 (1954).
3. H. C. Hamaker, *Physica*, 4, 1058 (1937).
4. E. J. W. Verwey and J. Th. G. Overbeek, in *Colloid Science*, I, edited by H. R. Kruyt, Elsevier Publishing Co., Amsterdam, 1952.
5. J. J. Chessick, A. C. Zettlemoyer and G. J. Young, *J. Colloid Sci.*, 13, 358 (1958).
6. A. S. T. M. Standards, Part 5, PP. 119f.f., 1952.
7. C. R. Bloomquist and R. S. Schutt, *Ind. Eng. Chem.*, 32, 827 (1940).
8. A. E. J. Eggleton and I. E. Puddington, *Canad. J. Chem.*, 32, 86 (1954).
9. M. J. Vold, *J. Coll. Sci.*, in press. M. J. Vold, *J. Phys. Chem.*, in press.
10. G. J. Young and J. J. Chessick, *J. Colloid Sci.*, 13, 358 (1958).
11. I. E. Puddington, *NLGI Spokesman*, 19, 10 (1951).
12. H. R. Kruyt and F. G. van Selms, *Rec. trav. chim.*, 62, 407 (1943).
13. E. K. Fischer, "Colloidal Dispersions," John Wiley, N.Y.C., pp. 128 ff, 1950.
14. L. Dintenfuss, *J.O.C.C.A.*, 41, 125 (1958).
15. J. E. Arnold, *J.O.C.C.A.*, 31, 248 (1948).
16. J. Th. Overbeek, Symposium on the Dynamics of Hydrophobic Suspensions and Emulsions, Utrecht, p. 121, 1937.
17. A. C. Zettlemoyer and J. D. Skewis, Presented before the Colloid Division, A. C. S., Atlantic City, Sept. 1959.
18. Sydney Ross and Harold F. Schaeffer, *J. Phys. Chem.*, 58, 865 (1954).
19. C. M. Hollabaugh and J. J. Chessick, Presented before Colloid Division, A.C.S., Boston, 1959.
20. E. F. Hare and W. A. Zisman, *J. Phys. Chem.*, 59, 335 (1955).
21. M. van der Waarden, *J. Colloid Sci.*, 5, 317 (1950); 6, 443 (1951).
22. E. L. Mackor, *J. Colloid Sci.*, 6, 492 (51).
23. E. L. Mackor and van der Waals, *J. Colloid Sci.*, 7, 535 (1952).
24. H. Koelmans, *Philips Res. Rpt.*, 10, 161 (1955).
25. A. Bondi and H. Diamond, *J. Colloid Sci.*, 12, 510 (1957).
26. J. L. van der Minne and P. H. J. Hermanie, *J. Colloid Sci.*, 8, 38 (1953).
27. See ref. 1, p. 152.



# An Interpretation of NLGI's 1958 Production Survey

By: Dr. J. V. Starr  
Esso Standard Oil Co.

**OFFICIAL QUESTIONNAIRE**  
**LUBRICATING GREASE PRODUCTION SURVEY FOR CALENDAR YEAR 1958**

Please provide an analysis of your production in accordance with the definitions and instructions below using this form. These are the only copies of this form which will be provided. Keep one copy, and please mail the other to: Manager of Management Services Division, Ernst & Ernst, 600 Sharp Building, Kansas City, Missouri, using the enclosed self-addressed, stamped envelope. Replies may be sent by registered mail.

Type of Thickener*	Production during calendar year of 1958 in actual pounds
<b>A. LUBRICATING GREASES</b>	
1. Aluminum Soap	Pounds Produced
2. Calcium Soap	Pounds Produced
3. Lithium Soap	Pounds Produced
4. Sodium Soap	Pounds Produced
5. Other Soap	Pounds Produced
6. Non-Soap (Inorganic Thickener)	Pounds Produced
Grand Total of Lubricating Greases	Pounds Produced
<b>B. TOTAL FLUID GEAR LUBRICANTS**</b>	
	Pounds Produced

**DEFINITIONS AND INSTRUCTIONS**

- Include all domestic production rather than sales data. In reporting your figures, be guided by the following ASTM definition for lubricating grease:  
"Lubricating grease - a solid to semi-fluid product of dispersion of a thickening agent in a liquid lubricant. Other ingredients imparting special properties may be included."
- Include all production regardless of destination; i.e., whether domestic or export.
- \*Greases containing two or more thickeners should be listed under the category whose characteristics predominate.
- Make no separate listing of EP greases.
- Do not include process oils, cutting oils, textile oils, etc. in the above figures.
- \*\*In 'B' above, report total production in pounds even though your product is sold by the gallon. Do not include production of fluid gear lubricants in the grand total production of lubricating greases as defined.

A Reproduction of the Ernst & Ernst Questionnaire

Again the National Lubricating Grease Institute has sponsored a survey of the production of Lubricating Greases and Fluid Gear Lubricants in both the United States and Canada for the calendar year 1958. As before, the survey was conducted by the management services division of Ernst & Ernst, certified public accountants. All questionnaires came from the agency and

the results reported to them. No data from an individual member company was made available to another company, nor to the Institute officers nor management. Only the final compilation was reported to the Institute office which has since distributed it to the membership. The professional integrity of Ernst & Ernst is our guarantee that the results are as accurate as the

## SUMMARY OF TOTAL POUNDS PRODUCED — UNITED STATES 1958 and 1957

LUBRICATING GREASES	Pounds Produced		Per cent	
	1958	1957	1958	1957
1. Aluminum Soap	21,275,526	27,142,543	3.97%	4.66%
2. Calcium Soap	179,708,385	218,844,369	33.56	37.61
3. Lithium Soap	182,457,197	160,462,383	34.07	27.58
4. Sodium Soap	113,570,809	128,859,083	21.21	22.15
5. Other Soap	19,874,925	28,680,446	3.72	4.93
6. Non-Soap (Inorganic Thickener)	18,597,992	17,891,004	3.47	3.07
Grand Total of Lubricating Greases	535,484,834	581,879,828	100.00%	100.00%

## TOTAL POUNDS OF FLUID GEAR LUBRICANTS PRODUCED

Pounds Produced	
1958	1957
495,298,609	473,999,270

data submitted and that complete anonymity has been preserved.

One of the most useful tools for planning in any industry whether in manufacturing, marketing or research is as accurate a record as possible of past performance. The Board of Directors was gratified at the reception accorded the first (1957) survey and feels that continuing this service will be a valuable contribution not only to our membership but also to suppliers of equipment, raw materials, containers etc.

Sixty-four questionnaires were mailed to active members and replies received from forty-seven for a return of 73.4 per cent. This was essentially the same as last year. Although a higher per cent return would enhance the validity of the survey, it is still felt that the figures represent a very substantial portion of domestic production. Overall it is indicated that the production of solid greases was down almost 8 per cent from 1957, doubtless reflecting in part the industrial recession early in the year. Already, it is apparent that production in 1959 will exceed that of 1958. By soap categories, production of calcium greases was significantly lower and that of lithium greases significantly higher than in 1957.

Production of fluid gear oils was indicated to be up 4.5 per cent over 1957. Figures on industry-wide production we feel, should be used with some caution. From sources which we believe to be reliable, it is estimated that the *reported* production is not more than about 60 per cent of the total. This arises from the fact that there are many compounders and blenders, not active members of the Institute, who produce these products and therefore an unknown portion of gear oil production is omitted from the NLGI survey.

For the first time, our Canadian friends were invited

to participate in the survey, and their response was 100 per cent. This should give each member an opportunity to assess his position in comparison with others in their own economy as well as to compare their trends with those in the U. S. It is evident that percentage-wise, Canadian production of calcium and soda greases is substantially higher, and that of some specialties lower than in the U. S.

#### ANALYSIS OF REPLIES — UNITED STATES

1958 and 1957

	1958	1957
Total questionnaires mailed	64	63
Total replies received	47*	48*
Per cent return	73.43%	76.19%

\* One reply reported no production data.

#### CLASSIFICATION OF RETURNS ACCORDING TO SIZE

##### Lubricating Greases

*Number of replies reporting production of:*

Less than 1,000,000 pounds	9	11
1,000,001 to 5,000,000 pounds	12	14
5,000,001 pounds and over	26	23
Total replies received	<u>47</u>	<u>48</u>

##### Fluid Gear Lubricants

*Number of replies reporting production of:*

No production data reported	2	6
1 to 1,000,000 pounds	14	13
1,000,001 to 5,000,000 pounds	11	11
5,000,001 pounds and over	20	18
Total replies received	<u>47</u>	<u>48</u>

#### SUMMARY OF TOTAL POUNDS PRODUCED — CANADA

1958

	Pounds Produced	Per Cent
<b>LUBRICATING GREASES</b>	1958	1958
1. Aluminum Soap	288,785	.88%
2. Calcium Soap	17,602,914	53.88
3. Lithium Soap	2,454,451	7.51
4. Sodium Soap	9,598,733	29.38
5. Other Soap	1,622,340	4.97
6. Non-Soap (Inorganic Thickener)	1,105,297	3.38
Grand Total of Lubricating Greases	<u>32,672,520</u>	<u>100.00%</u>

TOTAL POUNDS OF FLUID GEAR LUBRICANTS PRODUCED	31,963,603
--	------------

#### ANALYSIS OF REPLIES

Total active members mailed questionnaires	6
Total replies received	6
Per cent return	<u>100.00%</u>

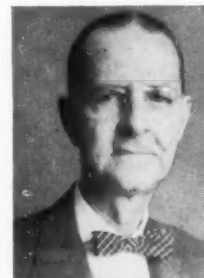
Perfecting a survey of this type is a process of evolution. Analysis of the 1957 figures in comparison with certain data from the Department of Commerce showed rather wide discrepancies. This, of course, is chiefly because our membership was asked to abide by the NLGI definition of a "Lubricating Grease" whereas we know that the Department of Commerce includes such products as protective coatings, soluble oils, cutting oils, etc., which while they may be made in a grease plant, are *not* lubricants.









A special committee of the Board is actively engaged in attempting to clarify certain points. For example, the "Other Soap" category is a little ambiguous, and it might be better to use "Other Metallic Soap."

### About the Author

J. V. STARR, head of the product planning division of Esso Standard Oil's petroleum specialties department, graduated from Wabash college and later received his Ph.D. at Cornell university. His career with Esso began in the technical service division laboratories and after promotion to various positions, he became assistant manager, lubricants and specialties division, until receiving his product planning promotion. A member of NLGI's board of directors since

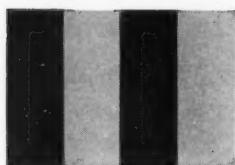
1954, he has been active on a number of committees, serving as chairman of the awards, board composition, and production survey committees. At the 1958 annual meeting he was elected to the re-created office of Secretary for NLGI. Ill health forced his resignation from the board at the 1959 annual meeting and the interpretation above was one of the final services he rendered the Institute after five years of conscientious effort for NLGI.



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# Literature and Patent Abstracts

## Soviet Research in Lubricants and Lubrication

Report No. 59-11902, December 1, 1958, U.S. Department of Commerce.

In order to obtain an appraisal of work in the U.S.S.R. and its satellites on lubrication and allied subjects, a survey was made of abstracts published in the American Chemical Society's Chemical Abstracts and in the Universal Oil Products company's Library Bulletins of Abstracts for the period from January 1950 through December, 1957. The references found totaled 123 and only one of these

made any reference to lubricating greases. This was entitled "Viscosity Properties and Behavior of Greases In Rolling Friction Bearings." An abstract of this article by Bezborod'ko, M.D., is given in C.A. Vol. 47, 6129a, 1953.

The first conclusion will be quoted because of its interest:

"1. Nothing is revealed in this study demonstrating that Soviet developments in this area are ahead of the U.S. No new, novel, or different methods, than known or used in the U.S., for providing lubrication at the extremes of temperature, or the extremes of equipment usage as they relate to bearing

speeds, materials and loads, were found."

## Application

*Chemical Week*, July 18, 1959, page 77, states that six '58 model taxicabs, fitted with ball-joint suspension bearings and steering linkage bearings made of Teflon TFE-fluorocarbon fiber, have operated 50,000 miles without lubrication. Use of these bearings was said to have eliminated 36 greasings and resulted in a saving of \$54 per cab during the test period. While the largest savings would accrue to fleets who run their vehicles for high mileages, private passenger car owners might save \$40 to \$50 per year by having such bearings in use.

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Acid Value	2.	178.	4.
Saponification Value	180.	188.	180.
Hydroxyl Value	160.	154.	171.
Heat Stability Loss of Acid Value (6 hrs. at 285°F)	NONE	24%	NONE
Loss of Hydroxyl Value (6 hrs. at 285°F)	NEGLECTIBLE	27%	NEGLECTIBLE

Samples and technical data on request.

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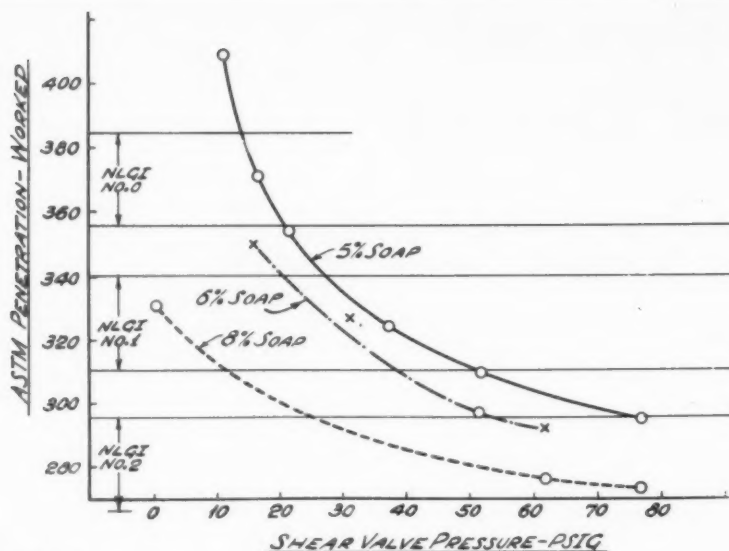


FIGURE 2

## Processing

### Processing Which Comprises Shearing Grease Mixtures at High Temperatures

An improved yield from a given soap percentage of lithium hydroxy stearate as an oil thickener is claimed by Dilworth, Jordan and Benge (U.S. Patent 2,886,525, assigned to The Texas company) if the soap-oil mixture is subjected to effective

shearing during transition from fluid to crystalline structure. For

a lithium 12-hydroxy stearate soap this transition range is from about 390 to 360°F. Cooling during this processing step is preferably at a rate of about 15°F. per minute.

The shearing device recommended is a shear valve and the pressure drop across the valve should be at least 75 psi. for best results. Figure 2 indicates the variation in worked penetration as the valve pressure is increased. When manufacturing an experimental lot of 60 pounds of lubricating grease, 50 pounds per minute were circulated through a cooler and then through the shear valve.

The following tabulation gives the penetrations of lubricating greases processed from the same soap-oil mixture containing 6 per cent of soap when different procedures were used.

Procedure	Penetration 77°F.	
	Unworked	Worked
Stirring, followed by milling	400+	400+
Chaffee Disc Disperser, 400-200°F.	352	321
Shear Valve, 15 psi back pressure, 400-200°F.	400+	350
Shear Valve, 30 psi back pressure, 400-200°F.	371	327
Shear Valve, 50 psi back pressure, 400-200°F.	332	292

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## Process and Composition

### Reducing Dehydration Time While Manufacturing Lubricating Greases

Nelson in U.S. Patent 2,888,402, assigned to Esso Research and Engineering company, uses the water of hydration of lithium hydroxide as the solvent for this alkali while carrying on saponification. The suggested method is to add lithium hydroxide monohydrate to mineral oil and heat this mixture to 210 to 225°F. where the water of hydration is liberated and dissolves the hydroxide. Fatty acids in excess are then added and after the lithium hydroxide is reacted saponification is completed by the addition of a non-hydrated metal hydroxide.

Thus, 7.2 pounds of lithium hydroxide monohydrate and 134 pounds of lubricating oil with a viscosity of 70 SUS at 210°F. were added to a steam-jacketed kettle where they were mixed and heated to 220° F. While maintaining this temperature, 56 pounds of cotton seed fatty acids were added. As soon as it was evident that the lithium hydroxide was entirely reacted, 3.2 pounds of calcium hydroxide was added in the form of a slurry in 50 pounds of oil. Heating and stirring was continued until the fatty acids were neutralized after which the mass was dehydrated at 290 to 300° F. Following this, heating was discontinued and 150 pounds additional oil was stirred in. The liquid mixture was further cooled and homogenized to give a transparent lubricating grease.

The finished product had an ASTM penetration of 311, a dropping point of 320 and free alkalinity of 0.1 per cent as sodium hydroxide. Barium hydroxide, magnesium hydroxide or zinc hydroxide may be substituted for the calcium compound in the second addition of alkali.

## Composition and Processing

### Clay Base Lubricating Greases

Armstrong and Preiss (U.S. Patent 2,886,524, assigned to Shell De-



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velopment company) describe the formation of a clay base lubricating grease useful at temperatures up to 450 to 500°F. The essential point in this lubricant is that the clay have adsorbed on its surface an oxidized aniline compound.

The steps in processing such a product are:

- (a) forming a clay hydrogel;
- (b) adding thereto 20-200 per cent by weight, based on the clay, of aniline, whereupon ani-

line is adsorbed on the clay gel, water separates therefrom and is removed by mechanical separation;

(c) displacing the water remaining in the gel with a water-soluble alcohol;

(d) adding 1-10 parts of a silicone lubricating oil thereto, with the amount being insufficient to form a cohered mass with the clay in the absence of alcohol;

(e) heating the mixture in the presence of air at a temperature of 300-500°F. for 4-48 hours, whereby the alcohol is removed and aniline is oxidized on the gel surface;

(f) finally adding to the heat treated product sufficient silicone oil to form a grease structure.

For example, one kilogram of 2 per cent hectorite clay aqueous slurry was acidified with 1.4 grams of 85 per cent phosphoric acid. To the mixture 40 grams of aniline was added followed by removal of water by filtration. The resulting filter cake was washed with two 1000 ml. portions of alcohol and then dispersed in another 1000 ml. portion of alcohol and 100 grams of DC-550 fluid added. The alcohol was then removed by evaporation and the mass was heated in a forced draft oven at 300°F. for two days. Finally, 100 grams of silicone oil was milled into the hard paste with the aid of a three-roll paint mill.

The resulting product was a black grease of smooth texture which operated for 198 hours to failure in an ABEC bearing test at 10,000 rpm and 450°F. A thin film showed 11 per cent evaporation after 24 hours at 450°F. and 2 per cent of oil separation occurred in two hours at 300°F.

### Composition

EP Additive for Mixed Lithium-Calcium Base Lubricating Greases

A mixture of additives which have a synergistic EP action in mixed lithium-calcium base lubricating greases consist of two to five weight per cent of certain trialkyl

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phosphites and 0.5 to 2.5 per cent of dialkyl selenides. Such combinations, which are described by Roach and Dilworth (U. S. Patent 2,886,526, assigned to The Texas company), are not as effective in straight calcium or straight lithium base lubricating greases.

For example, a lubricating grease was prepared having the following composition: 18.6 weight per cent lithium-calcium soap of a three to one mixture of hydrogenated castor oil and stearic acid in which the lithium and calcium metals were present in a six to four ratio, 0.2 per cent excess lithium hydroxide, 1.4 weight per cent glycerol (from the hydrogenated castor oil), 75.3 weight per cent of a base oil comprising three parts of 2-ethylhexyl sebacate and one part of paraffin

base oil having an SUS viscosity of 100 at 100°F., 0.5 per cent of an anti-oxidant comprising 95 parts of diphenylamine and five per cent salicylal amino guanidine oleate, three weight per cent triamyl phosphite and 1.0 per cent dialuryl selenide.

The above product, which had a worked penetration of 311 and a dropping point of 332°F., had a mean Hertz load of 47 kg. A similar lubricant containing a calcium base soap but with the same porportion of the two EP additives had a mean Hertz load of 28 kg. Likewise when the soap base was lithium only, the mean Hertz load was 24 kg.

#### Sulfonate and Sulfo-Carboxylate Containing Sodium Base Grease

By dispersing a small amount each of a sodium salt of an oil-soluble petroleum sulfonic acid, a sodium salt of a sulfo-carboxylic acid and a sodium soap in lubricating oil smooth sodium soap lubricating greases containing up to two per cent by weight of free sodium hydroxide can be made. Such products are described by Franklin and Gebhart in U.S. Patent 2,889,280, assigned to Gulf Oil Corporation.

A convenient source of the first two salts listed is Twitchell 9266 Base which has an average composition by weight of 38.2 per cent mineral oil; 5.8 per cent sodium sulfo-carboxylate; 47.4 per cent sodium sulfonate; 5.6 per cent water; and a trace of inorganic salts.

A typical lubricating grease contains 74.71 per cent 300 at 100°F. oil, 8.25 per cent each of sodium soap of Hydrofol A-B acids and Hydrofol 51 acids, 6.05 per cent of 9266 Base, one per cent phenyl alpha naphthylamine, one per cent of an 84 per cent concentrate of co-ammonium isoamyl isooctyl orthophosphate in light mineral oil, and 0.74 per cent excess sodium hydroxide.

This product had a dropping point of 398 and penetrations as follows: unworked 224, after 60 strokes 277, and after 10,000 strokes 283.

Such a lubricant was made by charging to a pressure vessel all of the fatty acids, flake sodium hydroxide and water, half of the 9266 Base, and enough oil to make a soap concentration of 40 to 50 per cent. Saponification was effected at a pressure of 30 to 50 psi and a temperature of 300 to 330°F. before discharging to another kettle where dehydration took place at the same temperature. The mass was then cooled to 210 to 220°F. and the remainder of 9266 Base and additional oil were added to give a mixture having about 25 per cent soap. Cooling and mixing were continued until at about 180°F. the additives were introduced followed by more oil to bring the lubricating grease to grade. The product can be finished with or without milling and drawn at about 130 to 140°F.

#### Silicone Lubricating Greases

According to Ragborg (U.S. Patent 2,890,170, assigned to Dow Corning corporation) addition of 0.01 to 0.1 per cent of benzotriazole to silicone lubricants imparts corrosion resistance. If desired, additional protection against the corrosion of steel is obtained by also including 0.01 to 0.5 per cent of an anhydride of alkyl succinic, alkenyl succinic, alkyl glutaric or alkenyl glutaric acids in the composition.

*Continued on page 334*

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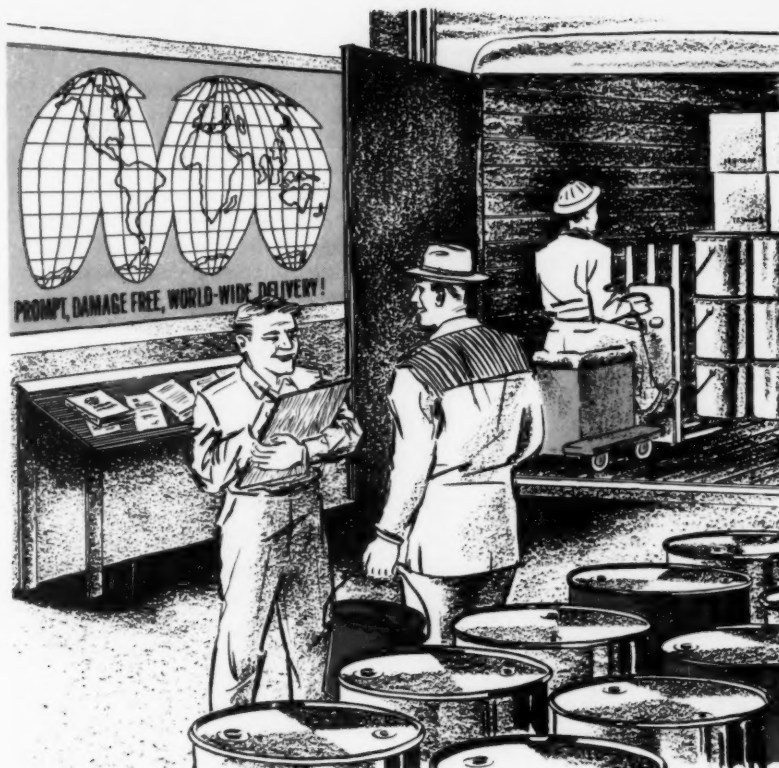
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Continued from page 332

For example a mixture of 250 parts of a trimethylsiloxo end-blocked dimethylpolysiloxane having a viscosity of 800 cs. at 25°C., 29 parts of Santocel and 0.1 part of benzotriazole were mixed on a three roll mill. Another mixture was made leaving out the last ingredient. Cleaned copper foil was coated with the two lubricants and placed in containers of distilled water at 700 C. The strip coated with the first lubricating grease showed no signs of corrosion at the end of four weeks, whereas the copper strip coated with the latter product showed corrosion and a green coating at inspection after six days.


Similar results were obtained when other thickeners, such as lithium soaps, carbon black or copper phthalocyanine were used and the suggested additive included.

### High Temperature Lubricating Grease

Lubricating greases which can be used at temperatures of 400°F. and above are described by Armstrong and Edgar in U.S. Patent 2,890,171, assigned to Shell Development Co.

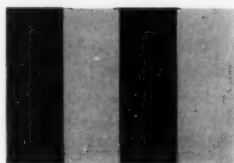
The fluids used are liquid dimethyl silicone polymers, that is silicone fluids. The thickener consists of one to twenty per cent of colloidal dispersed clay which has its surface treated with one to twenty per cent, based on the weight of clay, of a thermally resinsified thermosetting resin. This resin may be formed from a phenol and an aldehyde or from an amine and an aldehyde.

A lubricating grease embodying the above ideas was made as follows. Forty-seven parts by weight of phenol and 59.8 parts by weight of a 38 per cent aqueous solution of formaldehyde, together with 25

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parts of concentrated ammonia, were heated at 210°F., the reaction being stopped while the product was still soluble in acetone. Wyoming bentonite was dispersed in water and the gangue was separated from the hydrosol. Ethyl alcohol was used to replace the water from the hydrosol. Fifteen parts by weight of the clay in the form of the alcosol was combined with 1.5 parts of the phenol-formaldehyde monomer and 83.5 parts of a dimethyl silicone lubricating oil in the presence of an excess of acetone. After removing the solvent by heating, the mixture was heated to 450°F. for two hours to polymerize the resin on the surface of the clay. The mass was finally milled to form a lubricating grease.

This lubricant operated in a bearing at 10,000 rpm for 113 hours to failure at a temperature of 450°F. and for 790 hours at a temperature of 400°F.



## Industry News

Complete coverage of the new Charlotte "G" Series and "ND" Series Colloid mills may now be obtained from a recently released Chemicolloid Laboratories, Inc. catalog.

The mills, with design features from one horse power to 125 h.p. are available in cast semi steel and stainless steel (type 316) for lubricating grease process applications. New rotary shaft seals require less maintenance on difficult products and service and construction minimized clean-up time. All units can be modified for specific applications, upon request.

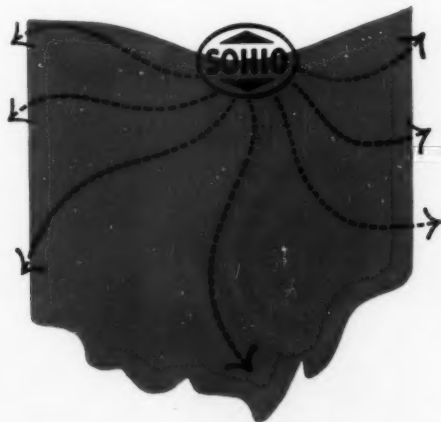
The new series is described in an eight-page brochure which may be

obtained by writing Chemicolloid Laboratories, Inc., 55 Herricks Road, Garden City Park, Long Island, New York. The company welcomes inquiries.

### Alpha-Molykote Announces New Gear Lubricant

Molykote Type 223X, a new heavy-duty gear lubricant available in SAE 90 and 140 grades, has been announced by the Alpha-Molykote corporation, Stamford, Conn.

Made from the highest quality solvent-refined paraffin base stock plus a special formulation of E. P. additives which include Molykote Type M-55, the new Type 223X is designed to provide satisfactory lu-



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brication wherever the following problems are encountered:

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- (b) unsatisfactory wear life; and
- (c) gears loaded beyond the recommendations of the gear manufacturer.

The new gear lubricant has equally good load carrying ability through the entire range from the

lowest to the highest sliding velocities and it is most effective in reducing wear.

Molykote Type 223X has a viscosity index of 100. Its flash point is 390°F. and its fire point is 420°F. Its specific weight is 7.5 pounds per gallon; has a pour point at 0°F.; contains a foam depressant, and is corrosion and oxidation inhibited.

For complete details write the Alpha - Molykote corporation, 65 Harvard avenue, Stamford, Conn.

## Marketing Division of API Distributes Leaflet

More than one million copies of a new leaflet on "How to Select the Proper Kind of Motor Oil" have been ordered by oil companies for distribution to their customers, the Marketing Division of the American Petroleum Institute has announced.

The four-color leaflet illustrates the API Service Classifications which determine the kind of motor oil a customer should buy in order to prolong new engine condition and get the best performance from his car.

It also contains the new API crankcase oil change recommendations which urge the customer to change his oil "in winter—every 30 days, in summer—every 60 days, but never to exceed 2,000 miles."

The rate at which oil deteriorates due to contaminants depends on driving conditions, the leaflet states. It points out that "the usual short-trip, stop-and-go driving is now recognized by both the automotive and oil industries as the most severe from the standpoint of oil deterioration."

It is expected the leaflet will receive direct mail and credit card enclosure use in addition to service station distribution.

## New Booklet Issued By API

A new booklet entitled 'Petroleum Marketing—Yesterday and Today' has been issued by the Marketing Division of the American Petroleum Institute.

The fourteen-page booklet provides an overall view of the industry's products and the typical channels through which they are marketed. It includes a brief description of marketing techniques of yesteryear and contrasts them with present-day operations.

The booklet was prepared as a means of answering general questions on marketing from students and teachers, as well as persons as-

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sociated with the industry. It contains capsule discussions on such topics as: the marketer's job, the service station, integrated and non-integrated marketers, specialties and petro-chemicals, and the consumer—the marketer's master.

Copies of the booklet (API Publ. 1532) are available free to nineteen copies from Division of Marketing, American Petroleum Institute, 50 West 50th Street, New York 20, N. Y. A charge of fifteen cents each will be made on orders of twenty or more copies.

## Second Edition of Book By H. H. Zuidema

A second edition of *Performance of Lubricating Oils* by H. H. Zuidema has been issued by Reinhold Publishing corporation. The author is a member of the product applications department of Shell Oil com-

pany and his new edition summarized and evaluates a wealth of data on the performance characteristics of lubricating oils under various conditions.

The book, first published seven years ago, now covers sections on multigrade motor oils, fretting wear, and paper chromatography. It is a monograph series of the American Chemical Society.

The book may be purchased from Reinhold at 430 Park Avenue, New York 22. The price is \$7.00.

## Forma Cloud and Pour Units

Forma Scientific introduces newly designed, Low Cost, Cloud and Pour Units, specifically to ASTM D 97 Standards.

New Aluminum Block Bath eliminates use of liquids, resulting in smaller load for refrigerating system to handle, giving fast pull-down rate. New Aluminum Block Bath also gives greater accuracy of bath temperature and uniformity of temperature in test chamber. Compressors hermetically sealed in oil gives noiseless, vibration-free operation.

May be purchased in multiple units or units supplementing existing equipment especially in lower temperature ranges.

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For further information: Forma Scientific, Inc., Box N 543, Marietta, Ohio.

## Bulletin on Separoids Available from Sonneborn

A new bulletin on Separoids—a family of products that aids in dewaxing and deoiling of lube oil solutions—is available from L. Sonneborn Sons, Inc., New York, New York, petroleum refiner and manufacturing chemist.

The Separoids—Separaid C and Separaid F—have proved highly effective in dewaxing where centrifuge or filtration is used. In addition, both can be applied in deoiling petrolatum and wax stocks, yielding a wax which is harder and which has a higher melting point.

Complete application and test data on Separaid C and Separaid F are contained in the bulletin.

Copies of the bulletin may be obtained by writing L. Sonneborn Sons, Inc., 300 Park Avenue South, New York 10, New York.

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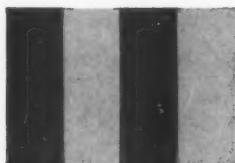
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## People in the Industry

### Kenneth B. Wood Appointed Manager, Lubrication Development For Climax

Appointment of Kenneth B. Wood, Jr. as manager of lubricant development was announced by Reuel E. Warriner, vice president sales of Climax Molybdenum company, a division of American Metal Climax, Inc. His responsibilities will be to develop new applications and markets for Moly sulfide lubricants.

Mr. Wood brings with him many years of experience in the oil industry, beginning as a trainee with the Texas Co.'s foreign sales department. Early in 1951, he was recalled to active duty with the Navy for a two year period and served in several capacities dealing with fuel and oil supply. Upon his release from active duty, he joined the Cities Service Oil Co. as an industrial sales engineer.

For three years, Mr. Wood was manager of lubricant sales for Cities Service Oil Co. in the New York region, and for the past year he has served as assistant manager—lubricant development, for Climax. Mr. Wood succeeds Mr. E. E. Smith who will continue as manager—

chemical sales, with responsibility for all commercial sales activities including promotion and handling of all commercial contact with customers and distributors.

Mr. Wood, a resident of Mt. Kisco, New York, is a graduate of the University of Virginia, a member of the American Society of Lubrication Engineers and NLGI's technical representative. He was a Naval aviator during World War II and is a former lieutenant commander in the Naval Reserve.

### Wallace & Tiernan Adds To Harchem Staff

Charles H. Rybolt, vice president in charge of chemical divisions for Wallace & Tiernan Inc., announces the following additions to the Harchem division staff.

Bruce Ainsworth, formerly with the chemical company of Celanese Corporation of America, has been appointed assistant to the vice president—chemical divisions. He has been assigned to the Harchem division with headquarters in Belleville, New Jersey. The division operates a plant in Dover, Ohio, manufacturing fatty acid compounds, sebacic acid and plasticizers. Howard Abbott continues as vice president of Harchem.

Dr. Jay Quinn, formerly with the Reading testing laboratory, Reading, Penna., has been appointed associate director of research for Wallace & Tiernan. He will be responsible for all Harchem division research activities.

### G. L. Howard Joins Delta Petroleum Co.

Delta Petroleum company is pleased to make the announcement that Grover L. Howard has joined Delta of New Orleans as domestic sales manager. Howard was also elected vice-president of Petroleum Packers, Inc., Delta's affiliate in Tampa, Fla., and will make his home in that area.

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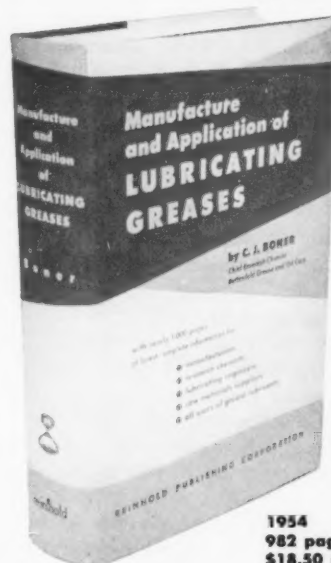
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- 8 Barium Base Lubricating Greases
- 9 Calcium Base Lubricating Greases
- 10 Lithium Base Lubricating Greases
- 11 Sodium Base Lubricating Greases
- 12 Lead Soap Lubricating Greases
- 13 Strontium Base Lubricating Greases
- 14 Miscellaneous Metal Soaps as Components of Lubricating Greases
- 15 Mixed Base Lubricating Greases
- 16 Complex Soap Lubricating Greases
- 17 Non-Soap Thickeners for Lubricating Fluids
- 18 Fillers in Lubricating Greases and Solid Lubricants
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The book begins by describing in detail the structure and theory of lubricating greases. Then follow chapters on the various raw materials, processes and manufacturing equipment. Lubricants containing specific thickeners, including such recent developments as lithium soaps, complex soaps and non-soap gelling agents, receive special attention.

Of major interest is the large section on present uses and future trends of lubricating grease products. Here you'll find the complete details of when, where, and how to apply a specific lubricant for any given purpose.

Everyone concerned with the preparation or use of grease lubricants will find Boner's book of enormous practical value. Manufacturers and lubricating engineers will find here a complete breakdown of the effects of each ingredient of treatment upon the characteristics of the final product, and a full explanation of the physical and chemical methods used in measuring these characteristics. Suppliers of fats, oils, additives, thickeners and other raw materials will gain new ideas for future product research and development. In addition, users of grease products will learn the properties of available lubricants and the major purposes that each fulfills.

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## Monsanto Establishes New Executive Position

Monsanto Chemical company has indicated its increasing stake in petroleum chemicals and functional fluids by establishing a new executive position of product director for these compounds in its organic chemicals division.

Reinhard S. Wobus of Belleville, Ill., former technical production manager of the division, has been appointed to the new post.

In making the appointment, Robert M. Morris, Monsanto vice president and general manager of the division, said that its rapid growth has made the product director's function necessary. The division's total sales have more than doubled during the past ten years. Petroleum chemicals and functional fluids have substantially contributed to this increase, Morris said.

As product director, Wobus is administratively responsible for

both the continuing growth and profitability of the division's petroleum chemicals and functional fluids program. He reports to the assistant general manager and is responsible for planning, recommending, coordinating and evaluating the efforts and results of the division's research, development, engineering, manufacturing and sales functions in behalf of his product group.

Morris pointed out that the product director's job is that of determining and recommending *what* is to be done for his products from the various departments. How they go about the job is up to them.

Commenting on his new position, Wobus said that all aspects of Monsanto's functional fluids and petroleum chemical program should benefit from the more effective effort that can be attained through closer administrative guidance which the division general manager himself no longer has time to provide.

Wobus is a native of St. Louis and received a BS degree in chemical engineering in 1931 and a MS degree in chemistry in 1933, both from Washington university. He joined Monsanto as a production supervisor in 1933 and served in production becoming plant manager of the company's Norfolk, Va., plant in 1938 and manager of the W. G. Krummrich Plant, Monsanto, Ill., in 1950.

He became technical production manager for the organic division in August, 1955, and held that position until becoming product director last month.

## Sunland Elects Berg as Executive Vice-President

G. A. Olsen, President of Sunland Refining Corporation, announced the recent election of Mr. Ole Berg, Jr., as executive vice-president of the corporation, as well as a member of Sunland's board of directors.

Mr. Berg began his oil career with the Union Oil company of California in 1921, remaining with that company in various positions until he became vice president.

In 1948 he resigned from Union Oil to join the British-American Oil company, of which he became president in 1951, and was also president of the British-American Oil Producing company with headquarters in Dallas, Texas. Mr. Berg was also a director of the Bank of Nova Scotia with branches throughout Canada.

Mr. Berg has been active in civic and petroleum organizations; is a past president of the Kiwanis club of Portland, Oregon; a member of the Jonathan club in Los Angeles; and a member of the American Petroleum Institute.

## Foote Names Regional Sales Managers

John D. Clark has been named sales manager, eastern region and Douglass S. Collins, sales manager, southern region, it was announced by Boyd E. Cass, general sales manager, Foote Mineral company, Philadelphia.

Clark, who has been with the company since 1943, was formerly manager of ceramic sales. He will remain at the company's Germantown offices but will assume responsibility for sale of all standard Foote products in the eastern United States.

Collins, who has been with the firm's electromanganese operation since 1942 will continue to operate from Foote's Knoxville, Tennessee office. Prior to his promotion, he had held important positions in sales and purchasing.

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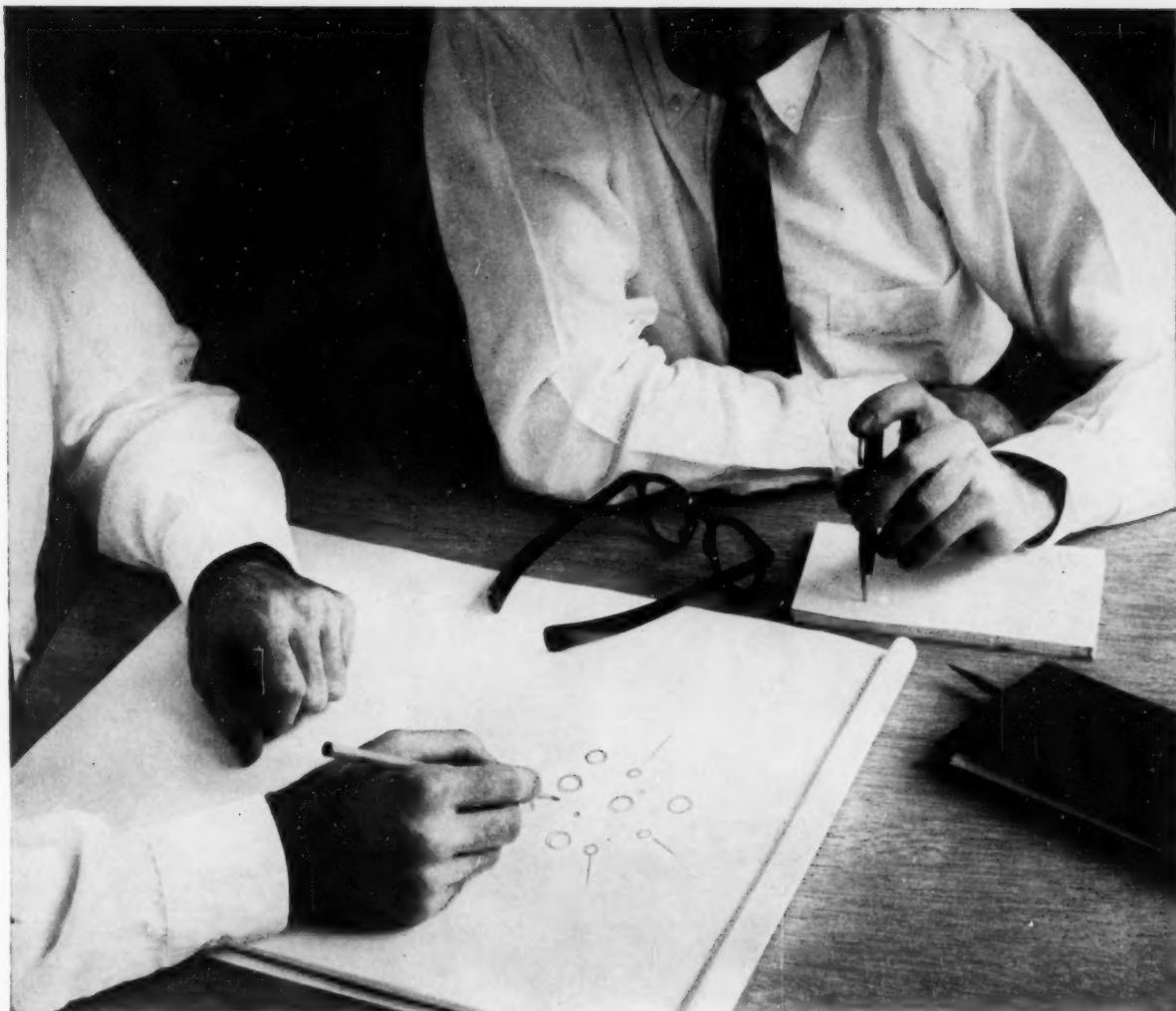
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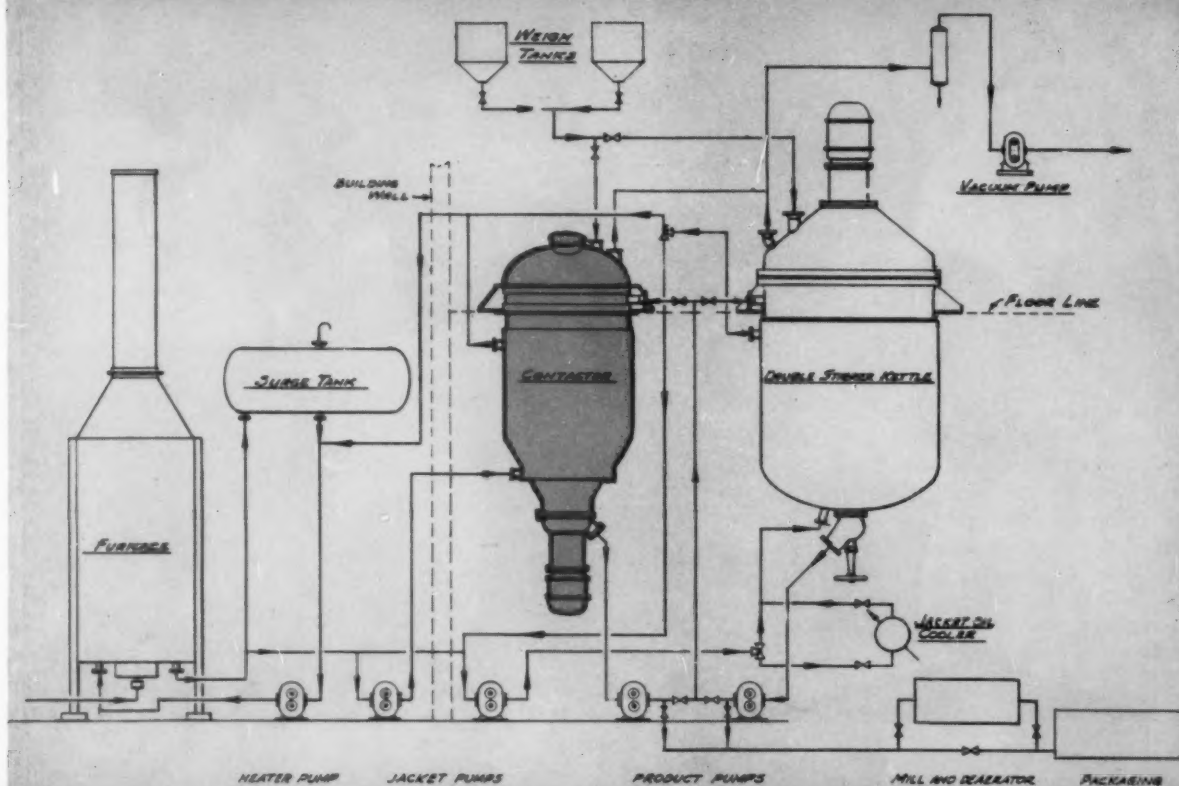
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The Stratco contactor is a highly efficient mixing device and when combined with the heating and cooling system shown above provides extremely close control of reaction temperature. With intimate contact between reactants and controlled temperature, very short batch time cycles are required.

Compared with other systems, Stratco

grease plants produce more uniform greases with less soap and require less laboratory control.

A complete Stratco plant layout is illustrated above. Equipment is adaptable to modernization programs as well as new installations. Specific equipment recommendations made without obligation.

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